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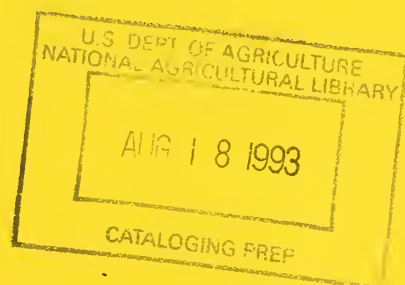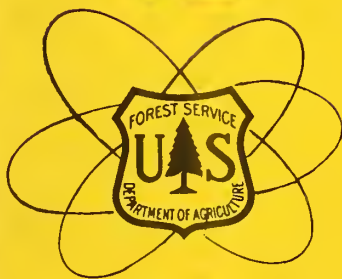
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REPORTS

OF

ANALYSIS TEAMS

COMPUTER STUDY WORKSHOP
MARCH 2-6, 1970

COMPUTER SYSTEMS STUDY

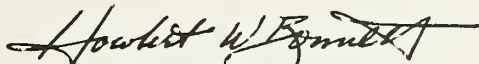## U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
DIVISION OF ADMINISTRATIVE MANAGEMENT

F O R E W O R D

The objectives of the Computer Systems Study are to
define Forest Service computing requirements and to
develop and implement a plan for meeting them. Ini-
tially, the study has been concerned with analyses of
present and future needs for equipment, personnel,
and organization.

This report presents the results of analyses and in-
formation collection activities conducted in connec-
tion with a Workshop where Forest Service computer
experts reviewed and analyzed much of the data col-
lected during the study. The contents of this report
identify areas requiring further investigation, provide
added input to the study, document preliminary analysis
of those portions of the study considered, and provide
an outline of possible study recommendation areas.

HOWBERT W. BONNETT
Project Leader
Computer Systems Study

i

T A B L E   O F   C O N T E N T S

1. INTRODUCTION

    A. PURPOSE

A Computer Systems Study Workshop was held in Alexandria, Va.,
March 2 through 6, 1970. This workshop was designed to bring
together the knowledge and experience of the top computer people
in the Forest Service, to apply their expertise to the analysis
of data collected and summarized as a part of the Computer Sys-
tems Study.

One of the objectives of the Computer Systems Study is to
define the Forest Service computing requirements. This includes
present and future needs for equipment, personnel, and organiza-
tion. It has resulted in the assembly of a large data base
relating to all aspects of Forest Service computer activities.

Because of limited staffing assigned to the study and the
need to fully consider all aspects of Forest Service computer
activities, the workshop and its team approach was selected to
insure the correct analysis of the data collected by the study.
Prior to the workshop, personnel assigned to the study reviewed
and summarized all of the data that had been gathered. The
information summarized by the Washington study team was then
assembled and organized to minimize time lost in analysis.
These materials were duplicated so that workshop participants
could each have a copy of all pertinent materials.

Neither time nor people were available in sufficient quan-
tities to permit the analysis of all subjects covered in the
overall study by this approach. For this reason, only six

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subject areas were selected for consideration during the workshop. Each of the six workshop teams was assigned a subject area for analysis.

The teams were so organized that the members represented differing organizational needs, ideas, and expertise. This assured a balanced and complete analysis of each subject. Team assignments varied by subject, but included analyzing data summarized by study personnel, and provided additional input based upon their experienced judgment.

A written report was prepared by each team, and their findings and recommendations were presented to the entire group. New points or differences of opinion raised during group discussion are included as Sections 2 through 7 in this report.

This report will be used by the Computer Study team as input to the study, for identification of areas requiring further investigation, and as skeletal recommendation areas to be considered for inclusion in the final study report.

<u>NOTE</u>

None of the enclosed reports necessarily represent final study conclusions and they should not be interpreted as such. The final study report will verify and expand the subjects covered by these reports as well as the areas not covered.

B. <u>WORKSHOP AGENDA</u>

<u>WELCOMING ADDRESS - C. Shields</u> - Welcome of participants to Washington, state Workshop purpose, introduce guests.

<u>KEYNOTE ADDRESS - E. Schultz</u> - Discuss current Forest Service problems and role of the computer and importance of the Study.

<u>STUDY OVERVIEW - C. Shields</u> - Review Study objectives, importance to all parts of the Service, and Study organization. <u>H. Bonnett</u> - Study approach, methods, and progress.

<u>OPERATIONAL DETAILS - H. Bonnett/C. Teague</u> - Explain Workshop agenda and Study Team approach. Review team organization, assignments, and procedural details.

<u>WORK ON TEAM PROJECTS</u> - Group will be split into 4- to 6-man teams, selected to provide a balanced Service-wide perspective to each project. Teams will meet separately to work on assigned projects. The projects which are listed below include review and verification of Study data summaries and preliminary findings as well as projects designed to add perspective to troublesome areas. The following is a list and brief description of the primary team projects.

1. <u>ADP Operations Management</u> - Review and analyze the summarized information pertaining to present ADP operations management and prepare recommendations for action that analyses indicate is needed.

2. <u>Manpower Requirement Guides</u> - Review and analyze available information pertaining to the estimation of manpower requirements by key tasks or job groups and develop a system for determining manpower requirements based upon defined workload.

3. <u>Part 1 - Source of Services</u> - Review and analyze available information on characteristics of the different types of sources of obtaining computer related services. Prepare a listing of all of the advantages and disadvantages of each approach.

   <u>Part 2 - Organizational Considerations</u> - Review and analyze available information on characteristics of different organizational arrangements related to ADP. Prepare a listing of all of the advantages and disadvantages of each approach.

4. <u>ADP Training</u> - Review and analyze the summarized information pertaining to training of ADP personnel and prepare recommendations for any action that analyses indicate is needed.

5. <u>Understanding of Other than ADP Personnel</u> - Review and analyze the summarized information pertaining to the understanding,

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attitudes, and training of non-ADP personnel in data processing and prepare recommendations for actions that analyses indicate are needed.

6. _Management of ADP Personnel_ - Review and analyze the summarized information pertaining to ADP personnel management practices and prepare recommendations for actions that analyses indicate are needed.

Each team is to be provided written objectives and all necessary materials in easily reviewable form. They will each prepare a written report of their subject/subjects for distribution to all participants in the Workshop and orally present this report to the Workshop.

COMPUTER WORKLOAD ANALYSIS SEMINAR - H. Bonnett, G. Bania, R. Moore - Explanation and discussion of methods used in connection with the definition prediction of computer workload using methods developed by Computer Learning & Systems Corporation.

DATA INPUT DEVICE ANALYSIS SEMINAR - C. Teague, L. Feidelman - Explanation and discussion of Source Data Input Device Study done by FAIM Information Services.

CURRENT OPERATIONAL PROBLEMS AND CONSIDERATIONS - L. Butrym - Discussion of key ADP topics of current non-Study nature that are of interest to all participants.

ADPE PROCUREMENT REGULATIONS - L. Butrym - Discussion of procurement policies related to ADP and planned changes.

GROUP DISCUSSION, SELECTED STUDY TOPICS - This session will be used to get expressions of group feelings on a number of questions raised by the Study that do not need the same level of review as the topics designated as team projects.

INDIVIDUAL REVIEW OF UNIT STUDY INPUT & TEAM PROJECT REPORTS - Copies of the data input by all Regions, Stations, and Areas describing their computer workload, equipment, and practices will be available for attendees to validate and the Workshop Team Project Reports will be distributed for individual review prior to discussion the following day.

TEAM REPORTS AND GROUP DISCUSSION - Each Workshop Team Project Leader will present the report developed by his team to the entire group and adequate time will be provided for discussion of the report. Each team will be responsible for recording and writing up additional key points or changes resulting from the group discussion.

SUMMARY AND REVIEW OF STUDY ACTION PLANS - H. Bonnett - Presentation of Study project plans, time schedule, and close Workshop.

SCHEDULE

COMPUTER SYSTEMS STUDY WORKSHOP, MARCH 2 – 6, 1970

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
9	Welcome – C. Shields Keynote – E. Schultz	WORK ON TEAM PROJECTS	Seminar Presentation of Computer Load Analysis Techniques – Bonnett, Bania, Moore	TEAM REPORTS AND GROUP DISCUSSION	TEAM REPORTS AND GROUP DISCUSSIONS
10	Study Overview – C. Shields H. Bonnett		Seminar Presentation of Data Input Device Analysis Study – Teague – Feidelman		
11	Operational Details & Original Project Terms – H. Bonnett, C. Teague				
12	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
1	WORK ON TEAM PROJECTS	WORK ON TEAM PROJECTS	Current Operational Problems and Considerations – Butrym	TEAM REPORTS AND DISCUSSION	Summary and Review of Study Action Plans – Bonnett
2			ADPE Procurement Regulations – Butrym		
3			Group Discussion, Selected Study Topics – Bonnett		
4					
5					
DINNER	DINNER	DINNER	DINNER	WORKSHOP COCKTAIL PARTY & DINNER	
7					
8	WORK ON TEAM PROJECTS	WORK ON TEAM PROJECTS	Individual Review on Unit Study Input and Team Project Reports		
9					

D. WORKSHOP PARTICIPANTS

NAME	UNIT	TITLE
David P. Blodget	Region 1	ADP Branch Chief
Pat Cox	Region 2	Computer Specialist
Gary Beamer	Region 3	ADP Branch Chief
Floyd J. Burnett	Region 4	ADP Branch Chief
Thomas Stevenson	Region 4	Computer Syst. Analyst
Leslie M. Oliphant	Region 5	Computer Syst. Analyst
Alvin R. Walls	Region 6	ADP Branch Chief
Deward W. Singleton	Region 8	Computer Syst. Analyst
Virgil E. Findell	Region 9	ADP Branch Chief
Paul R. Laidly	North Central Station	Biometrician
Donald W. Seegrist	Northeastern Station	Biometrician
Dorothy E. Martin	Pacific Northwest Station	Math. Statistician
Clyde A. Shumway	Pacific Southwest Station	Computer Syst. Analyst
Jacob L. Kovner	Rocky Mountain Station	Station Biometrician
Hans T. Schreuder	Southeastern Station	Station Biometrician
Warren L. Nance	Southern Station	Biometrician
Wencil W. Wlodarczyk	Forest Products Laboratory	Supv. Comp. Programmer
William W. Barton	NE Area, S&PF	Forester
Charles F. Krebs	SE Area, S&PF	Biometrician
Gary D. Steber	SE Area, S&PF	Forester

NAME	UNIT	TITLE
Philip R. Haug	Management Sciences Staff PSW-Berkeley	Computer Syst. Analyst
George L. Perry	W.O. Div. of Coop.For.Mgt.	Program Analyst
James D. Hogan	W.O. Div. of Engineering	Civil Engineer
David L. Neebe	W.O. Div. of For.Economics & Marketing Research	Research Forester
Lyle L. Boehler	W.O. Div. of Budget & Finance (National Finance Office)	Asst. Dir. for ADP
D. Ross Parry	W.O. Div. of Budget & Finance (National Finance Office)	Computer Syst. Analyst
* Gladys E. Bania	W.O. Div. of Adm. Mgt. (Computer Systems Branch)	" " "
Ronald R. DeClark	" "	" " "
Alan D. Freas, Jr.	" "	" " "
* Charles P. Teague, Jr.	W.O. Div. of Adm. Mgt.	Management Analyst
* Robert C. Thatcher	W.O. Div. of Forest Insect & Disease Research	Entomologist
* Howbert W. Bonnett	W.O. Div. of Adm. Mgt. (Computer Systems Study)	Project Leader

* Members of Computer Systems Study Team.

SECTION 2

DISCUSSION OF TYPES OF COMPUTER SERVICES

AND

ORGANIZATIONAL ARRANGEMENTS

Members   Team 3

Name	Title	Organization
James D. Hogan *	Civil Engineer	WO Div.of Engineering
Gary D. Steber **	Forester	SE Area S&PF
Clyde A. Shumway	Computer Systems Analyst	PSW Station
Lyle L. Boehler	Asst.Dir. for ADP	WO - N.F.O.
Jacob L. Kovner	Station Biometrician	RM Station

* Team Leader   ** Recorder

TEAM OBJECTIVES

A. Review and analyze available information on the character-
istics of the different types of sources of obtaining
computer related services. (i.e., in-house, facility
operations contracts, contracting, etc.) Prepare a
listing of all of the advantages and disadvantages of
each method.

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B. Review and analyze available information on the
    characteristics of different organizational arrange-
    ments related to ADP. (i.e., service group vs
    functional handling of systems analysis and design.)
    Prepare a listing of all of the advantages and dis-
    advantages of each approach.

INTRODUCTION

Any organization is controlled and directed through its avenues of
communication. Those avenues of communications which permeate
the organization to the greatest extent are most responsive to
top management direction.

Computer technology has and is creating a new and very
extensive channel of communication within organizations. The need
for data processing and information handling exists across organ-
izational lines from top to bottom. As these needs are met by
establishing an organization to provide computer services, a new
channel of communication is created. Projects within a Station
become more aware of what other projects are doing through their
data processing efforts. Regions start to interact in helpful
ways through their data processing activities on a common computer.
Examples like the Forest Service road design systems and use of the
CDC 3100's in Regions 1, 4, 5, and 6, and the use of a UNIVAC 1108
in Regions 2, 3, 8, and 9 have brought about involvement among
Regions on similar problems and established new communications
channels.

The need to utilize computer technology in the accomplishment
of the Forest Service mission is clear. This need exists at all
levels. As the support to provide computer services grows to fill
these needs, the creation of a new avenue of communication pene-
trates the organization further. This avenue of communication

INTRODUCTION (continued)

should be used, as any other is used, by top management, to direct and focus the efforts of the organization, and directly influence the quality and extent of this new avenue of communication. This new communications link will extend upward in the organization to the extent that coordinated computer services are provided. It will extend downward to the last direct user. This could be as narrow a span as from a Regional Operations Branch Chief to Regional staff specialists. Or it could be as broad as from Chief and Staff to Ranger District Staff.

The organization to provide computer services and the role that organization plays in providing this service will affect the very nature of the Forest Service and its mission as expressed through its actions. The need for computer technology is not for its own sake, but to facilitate the accomplishment of the many tasks of the organization. It, therefore, must be fully supportive of these efforts and its use be controlled by needs. It should be organized and its role specified to affect the means of carrying out the Forest Service mission, rather than merely fitted within the present structure.

The advantages and disadvantages associated with alternatives for providing computer services and for organizational arrangements are tabulated in appendix A. For a comparison of tabulations to be meaningful, it is necessary to describe in what manner computer services will be used and what organizational concepts are needed in light of the concepts expressed in the introduction.

THE USES OF COMPUTERS

A. <u>Problem Solving</u>. This service is used mainly by researchers, scientists, economists, engineers, etc. Their activities vary from solving small problems, such as the closure of a traverse, to complex problems such as the simulation and study of a transportation system. These problems require interaction between man and computer. This interaction may be immediate, or a time lag of minutes to several hours may be acceptable. Amounts of data vary from little (a set of 10 values) to vast (a digitized terrain model, transportation network, resource data).

B. <u>Business Applications</u>. The users in this case are primarily management analysts, budget analysts, accountants, managers, etc. Researchers, scientists, etc. will also have use in this area. The bulk of the use will not require instantaneous turnaround or non-computer interaction.

Most processing will involve vast amounts of data manipulation or handling with very little computing. However, there exists a need for direct inquiry of the system or data bank which may require real-time processing (management information systems).

In both cases, the communication of data, or ability to access data, is vital to successful use of the system. This communication process is possible and with appropriate equipment and support organizations, can be implemented.

THE PROBLEM

The tables presented in Appendix A, comparing advantages and disadvantages of various types of installations and organizations, need insight and background before they can be used as an evaluation tool. We feel that the communication value of computers offers one such perspective.

Of the items suggested for discussion as alternatives in obtaining computer services and organizational arrangements, the following will have the most profound affect on how the Problem Solvers and Business Administrators will operate. They will also affect the ability to communicate data within the organization as described in the introduction.

      1. Centralized vs. Decentralized Operations

      2. Timesharing or Remote Job Entry vs. Batch Processing

      3. Open vs. Closed Shop

1. Centralized vs. Decentralized Operations

For example, there is a table on advantages of centralized versus decentralized operations and one on centralized versus decentralized coordination and control. The communications concept takes these tables and brings forth a centralized - decentralized operation, which is certainly not new, but with an added or enhanced dimension.

The basic system is built around a large powerful computer at a central location. Geographically dispersed at the Regional level, say, are smaller computers which can automatically call on the additional power of the central unit. At each Forest level there

would be remote terminals into the Regional installations.

The research units could be integrated into this system with a link through remote terminals. This can all be done with present technology.

The benefits to be derived from such a system are almost unlimited communication in any direction within the Forest Service as an operatory unit. Data banks stored at central unit and secondary units become available. A common pool of programs is built up for general use. Recognition of activities will lead to more cooperation and better use of facilities. In fact, the system is only limited by user capability and could be expanded or upgraded as fast as personnel recognize that they can contribute to this communication channel.

It should be pointed out that successful communication between the doer and top management requires that each element - terminals at Forest or similar organizational level, satellite computers at Regional office, and a large central computer - be present. Absence of elements can stop the flow of information below the Regional level or upwards to top management levels. It may be logical to begin with the ability to communicate upward to the Washington Office.

2. Timesharing, RJE (remote job entry or remote batch) and Batch Processing.

In order to create and to maintain avenues for communication within the Forest Service, the type of data processing used can be an important factor. There are three basic types - Timesharing, RJE, and

batch - but for this discussion Timesharing/RJE will be considered as one.

Timesharing/RJE, without a doubt, is the best for creating an atmosphere of greater and more efficient computer use. The principal computer is necessarily large and fast and the software system has to be sophisticated enough to accomplish the job needs of the several remote users. These jobs, in time, become more sophisticated and efficient which tends to lead to the development of new applications. Computer Analysts, programmers, and users (foresters, engineers, statisticians, etc.) become more "at home" with the computer and interaction and avenues for communications among and between the remote users is just a matter of time. The result is increased use and efficiency of "standard" computer programs and increased use of the computer as a sound, working tool for the user.

Batch processing, on the other hand, offers little incentive for creating the atmosphere in which interaction and communications can thrive. Because each user is not "attached" to a common computer (as in timesharing/RJE), jobs tend to become user-oriented and generally not as efficient. Also overall costs are just as great as time sharing/RJE and new applications development is impeded.

3. Open Shop versus Closed Shop.

Open shop philosophy - The basic functions of data processing
are computer scheduling, computer maintenance, programming,
establishing programming standards and training personnel of
other divisions. Systems and programming capability is decentral-
ized and maintained by the respective user units who then use the
data processing facility as a service center. Lines of communi-
cation open up quickly with some use of open shop.

In a closed shop operation, data processing provides the
systems analysts, programmers, operation and education. The
functional units may have systems analysts under either philosophy
of operation.

Both open shop and closed shop operations have important
advantages and disadvantages depending on the types of applications
handled, the degree of integration of the system, the amount and
variety of equipment and personnel available. However, if the com-
puter is going to be used as a working tool for problem solving,
communications and support, a combination of the open shop and
closed shop approach would be much more effective and open lines
of communication.

(Information sources utilized by the team included:
Management of Automatic Data Processing Systems, by Marvin M.Wofsey,
pg. 28-30, The Successful Computer System, by J. Orlicky, EDP
Analyzer, Overall Guidance of Data Processing, by Richard C.Canning,
Aug. 68,Vol.6, No.8,pg.8, Management Objectives: Economical Use of
Computers, by J.R. Callahan in Computers & Automation,Dec.67,pg.12)

SUMMARY

We attempted to point out the potential of a computer system or network to enhance communications within the Service. This avenue of communication will greatly affect the way we operate in the future. Consideration of computer systems which are not suited to communication and of support organizations which are not flexible and strong enough to support the system and its users will result in nullifying the use and development of a communication avenue as we have described it.

Group discussion also pointed up the need to provide computer service and communications links to people at the field level offices at an early point in time.

TEAM 3

APPENDIX A

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A. OBTAINING COMPUTER-RELATED SERVICES

1. Centralized vs. decentralized operation (hardware)

Centralized: (Central Batch processing with communication

input by mail)

Advantages	Disadvantages
- Economy - no duplication of organization, hardware or software maintenance.	- Lack of communication.
	- Not as responsive to user needs.
- Can afford a larger system.	
	- Systems Analysts too far from user.
- Only single system software to maintain.	
	- More complex system software to maintain.
- Smaller training program for computer system personnel.	
	- Reduces individual initiative.
- Data bank accessible to users.	
	- Doesn't meet human needs to be closely related to computer.
- Promotes interchange of information.	
	- May be too restrictive for user.
	- Massive data reduction, logistics problems.

2. Facility Management Contract

Advantages	Disadvantages
- May have greater efficiency (management) (more for the money)	- Operator not familiar with users needs
	- Will not develop expertise in-service. Inhibits flexibility
- Doesn't require personnel ceilings	
	- Policy of USFS?
- Can budget for specific sums	
	- Morale problem?
	- Could cost more
	- Bound by contract - loses responsiveness to meet needs.

3. "Open" vs. "Closed" Shop

Open Shop

Advantages

- Specialists involved in systems and programming.

- Users can set own programming priorities.

- User has more confidence in programs.

- Better suited to research and other scientific applications.

- Excellent training tool.

Disadvantages

- Inefficient programming and use of computer time.

- Requires additional training (more concern for training).

- Inefficient use of professional skills to do programming and processing.

4. <u>Timesharing/RJE (remote job entry) vs. Batch Operations</u>

<u>Timesharing/RJE</u>

<u>Advantages</u>	<u>Disadvantages</u>
- Faster turnaround.	- Not suited to large volume of I/O.
- Provides computing power to those who could not afford otherwise.	- Hardware more costly.
- Allows interactive immediate problem-solving, programming, debugging (except RJE).	- System software is complex, i.e.,more costly to maintain.
- Generally less user time required for a given job.	- To do a given job, CPU charges are higher for same machine.
- Greater user flexibility.	- Additional cost of terminal and telecommunication lines.
	- Machine failure affects more users.
	- Less CPU time (possibly) available for computing.
	- Restricted to use of languages such as BASIC, ALGOL, FORTRAN, COBOL.
	- Training problems.
	- Regularly scheduled jobs (I.E., payroll) don't need available response time.

5. <u>Free Standing (local, on site) vs. Computer Facility/RJE</u>

Free Standing

<u>Advantages</u>   <u>Disadvantages</u>

- May be less expensive - doesn't   - Limited to capabilities
  require RJE hardware.   of local computer.

                                                              - Access to more computing
                                                                capacity involves more
                                                                contracting effort.

                                                              - Hinders communication
                                                                between using units.

                                                              - Limits accessibility to
                                                                the computer.

                                                              - Duplication of hardware
                                                                and organization.

6. <u>Owned vs. Leased Equipment</u>

Owned Equipment

<u>Advantages</u>   <u>Disadvantages</u>

- Has possibility of being   - Management tendency to
  cheaper in the long run.   retain equipment longer -
  (5 years +   in terms of   difficult to keep current
  out of pocket cost.)   with technological
                                                              advances.
- More initial bargaining
  leverage with manufacturer.   - Less leverage with manu-
                                                                facturer for ongoing
                                                                service & maintenance.

                                                              - Requires large initial
                                                                funding.

                                                              - Harder to stay abreast of
                                                                technological change.

                                                              - Computing power per unit
                                                                of time or money decreases
                                                                with advances in technology.

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7a. In-house vs. Outside Source of Computer Service (general)

Outside Source

Advantages	Disadvantages
- No need to maintain expertise for system software and hardware support.	- Limited control over system software maintenance.
- Profit motive and competition should result in efficient service.	- Limited control over improvements or change in software and hardware systems.
- User has access to large computer when needed.	- Limited control over computer time available.
- Beneficial to low-volume user.	- Not conducive to interchange of information within user organization.
- May have more software available	
- Requires fewer personnel ceilings.	- Difficult to coordinate user system development.
	- Does not lead to development of in-house expertise.
	- May be more costly and less convenient.

7b. Inhouse vs. Types of Outside Service

Other Government Agency

Advantages	Disadvantages
- Generally lower cost than private firms.	- Not usually in business to serve other agency's needs.
- Don't have to justify aquisition of in-house equipment or use of government facilities.	- No incentive to provide support services.
- Improved communications with other agencies doing similar work.	- May have hardware but lack personnel to handle additional workload.
	- May be thrown off system on short notice.
	- Poor turnaround, low priority on your work.
	- Inconvenient access.

7c.   In-house vs. Types of Outside Services

Universities

Advantages	Disadvantages
- Usually less costly than private services.	- Because not profit motivated, generally less well managed.
- Expertise is usually present, but usually hard to utilize	- Policy problems - competing with private enterprise.
- Access to training.	
- Latest software techniques may be available.	- Trend toward not doing non-university work.
- Contact helps maintain cooperative relations and working arrangements with universities.	- May not be service-oriented.
	- May get major changes without notice.

7d.   In-house vs. Types of Outside Services

Private Firms

Advantages	Disadvantages
- Usually have expertise in field.	- Most costly as to total cash outlay.
- More efficient because of profit motive.	- Difficult to justify or obtain approval.
- Service is usually good (usually get what is paid for).	- Involves competition - may not get most qualified firm.
- Possible to get more done in less time.	- Difficult to evaluate proposals prior to performance.
- Stronger control than with universities.	- Service is only as good as our contract specifications.
	- Requires time to administer contract.
	- If contract changes, problems will arise.

8. Single vs. Multiple Supplier of Computer Service

Single Supplier

Advantages	Disadvantages
- Provides a single type or manufacturer of equipment.	- Not flexible - restricts choice of equipment.
- Need to learn only one type of equipment.	- Restricts user's access to other programs.
- May result in lower costs.	- Unlikely that it will fill all needs.
- Lesser communication problem.	- Scheduling and available time problems may arise.
- More control over operations.	
- Less maintenance problems than with multiple manufacturer.	

9. Contracting for all Computing Services

Advantages	Disadvantages
- Easier to change to improved equipment.	- Probably more costly out of pocket cost.
- Operations may be more efficient.	- No expertise developed in-house, limits flexibility.
- Fewer government personnel required (less ceilings, etc.)	- Communication problem - educating contractor to Forest Service needs.
- Force better planning.	- Response to needed changes is slower since contract terms apply.
- Best for special short-term jobs.	- Don't have full & immediate control over contractor.

B. DIFFERENT ORGANIZATIONAL ARRANGEMENTS

   1. Centralized vs. Decentralized Coordination and Control

                         Centralized

         Advantages   Disadvantages

   - More efficient development   - Tends to inhibit initi-
     of applications.   ative.

   - More efficient use of computer - Many variances from
     (scheduling, etc.).   "standard" approach may
                                       be necessary.
   - Better documentation as a
     method's standard.   - Necessitates setting
                                      priorities among a broad
   - Reduction in needed manpower.   field of users.

                                    - Not flexible and respon-
                                      sive to unique situations
                                      (BUT this shouldn't be
                                      this way!).

                                    - Increases distance between
                                      user and installation.
                                      (accessibility)

   2. Unit Computer Coordinator vs. Individual Contact

                       Unit Coordinator

         Advantages   Disadvantages

   - Fewer people to keep informed. - Individual may feel "cut-
                                       off" from computer or
   - Improves communication between   ADP service.
     user and ADP.
                                     - May inhibit user's learn-
   - Span of control is more   ing of data processing.
     practical.

   - May increase computer use
     by unit.

   - Eliminates duplication.

   - Reduces impact on ADP unit.

3. Level of Assignment

        Below Division or Assistant Director:

        Advantages   Disadvantages

- NONE!   - Lack of communication
                                          from upper management.

                                        - Divisional influence on
                                          operation of the ADP unit.

                                        - Not able to deal direct-
                                          ly with all users at top
                                          management level.

                                        - Top management too far
                                          removed from control of
                                          computer.

                                        - Limits career ladder.

4. Assignment of Computer Specialist to Functional Unit vs.
to ADP units.

                        To Functional Unit

        Advantages   Disadvantages

- Closer to the user, i.e.,   - More personnel required
  reduced communication   (less efficient utiliza-
  problems.   tion).

- Allows more flexibility in   - Programmers and Analysts
  approach to problems.   tend not to be as efficient
                                          as those in ADP unit be-
- Easier to get and maintain   cause they may be at lower
  personnel ceiling.   grade and experience
                                          level.

                                        - Recruiting and training
                                          problems.

                                        - Faster turnover.

                                        - Increased difficulty in
                                          communicating with other
                                          computer people.

                                        - Harder to get training -
                                          keep abreast of technology.

                                        - Supervision of quality of
                                          work more difficult.

                                2-20

5. **ADP Management Direction by Committee (Team) versus Line Officer**

Committee (Team)

<table>
<tr><td align="center">Advantages</td><td align="center">Disadvantages</td></tr>
<tr><td>

- Committment easier to attain.

- Participation in direction by users.

- Joint target setting.

- Line of communication is more open - not as subject to "filtering."

</td><td>

- Active participation is essential - "rubber stamping" is the danger.

- May be difficult to reach a decision as rapidly.

</td></tr>
</table>

6. Organization of an ADP Unit and New Applications along Functional versus Project Lines

FEATURE	PROJECT TEAM OR GROUP	FUNCTIONAL
Management Attention and Control	Tends to be strong	Sometimes weak, poorly defined
Risk of Failure	Lower	Higher
Technical Proficiency	Tends to be average due to multiple functions	Frequently strong and highly polished
Development of Personnel	Substantial opportunities for job enlargement and broader develop-ment	Attention is toward high competence in narrow field of activities
Cost to Complete Entire Job	About the same	About the same
System Operational Efficiency	Lower	Higher due to technical expertise
Level of Knowledge about the Application and subject matter area.	Higher	Lower
Overall Technical Coordination	Lower	Better
Overall Flexibility in Making Personnel Assignments	Somewhat rigid	Usually good within specialty area
Group Morale and Interest in End Product	Higher	Lower

7. Consolidation of Systems Analysis and Programming Functions
    Organizationally versus each as a Separate Organization
    Entity.

FEATURE	SEPARATE ORGANIZATION	CONSOLIDATED ORGANIZATIONS
Management Attention and Control	Tends to be strong	Sometimes weak, poorly defined
Risk of Failure	Lower	Higher
Technical Proficiency	Tends to be average due to multiple functions	Frequently strong and highly polished
Development of Personnel	Substantial opportunities for job enlargement and broader develop-ment	Attention is toward high competence in narrow field of activities
Cost to Complete Entire Job	About the same	About the same
System Operational Efficiency	Lower	Higher due to Technical expertise
Level of Knowledge about the Application	Higher	Lower
Overall Technical Coordination	Lower	Better
Overall Flexibility in Making Personnel Assignments	Somewhat rigid	Usually good with-in specialty area
Group Morale and Interest in End Product	Higher	Lower

8. Assignment of ADP to a Parent Unit versus Separate
    Organizational Unit

Separate Unit

Advantages	Disadvantages

- Primary mission is ADP service
  - no functional ties
    (favoritism)
	- If majority of work lies
	  within a particular
	  function, there would be
	  no need for a separate
	  organization

- More efficient operation	

- More career advancement
  opportunities
	- More complex operation
	  and scheduling

- Better communications between
  divisions at division level
  (better coordination)
	- May be more restrictive
	  (autocratic)

- Greater participation by unit
  in management decisions
	- Increases organization
	  overhead

9. Responsibility for system development with functional
    personnel vs. Computer personnel.

Functional

Advantages	Disadvantages

- Subject Matter Specialists
  are available
	- May be a lack of knowledge
	  of computer system and
	  operating characteristics.

- Few Communication Problems	
- Allows more flexibility	- More personnel required.

- Rapid response to changing
  needs (ability to change
  priorities)
	- May result in less efficient
	  programs.

- Broader understanding and
  analysis of problems and
  potential in a given function.	

- More commitment to make system work.	

10. <u>Service vs. support organization</u>.

    Service = Across the counter service; provides computer
          and all supporting systems analysis and
          programming.

    Support = Support user in doing job by providing access
          to computers and high-level guidance in
          systems and programming. Actual "doing"
          will be by user or will be his responsibility.

- A mixture is desirable.

- Direction should be toward support concept.

SECTION 3

UNDERSTANDING OF NON-ADP PERSONNEL

MEMBERS - TEAM 5

NAME	TITLE	ORGANIZATION
Virgil E. Findell*	ADP Branch Chief	Region 9
Warren L. Nance **	Biometrician	SO Station
David L. Neebe	Research Forester	WO Div. For. Ec. & Mkt.Res.
Charles F. Krebs	Biometrician	SE Area S & PF
George L. Perry	Program Analyst	WO Div. Coop. For. Mgt.-(S&PF)

* Team Leader   ** Recorder

TEAM OBJECTIVES

Review and analyze the information summarized from the Computer

Understanding Questionnaire. Prepare recommendations for action

that analysis of the understanding, attitudes and training of non-

ADP personnel indicates is needed.

I. INTRODUCTION

In a survey conducted by Case and Company, the management consulting firm, of 865 top-level executives from over 600 companies:

1. Forty percent showed major dissatisfaction with achieving the original goals of their first computer installation, even though almost all of the companies have had computers for 5 or more years.

2. Forty-five percent showed greater dissatisfaction with the scope of their present computer efforts.

3. Almost all agreed that their company had failed to utilize the computer's capabilities.

The executives cited two major reasons for the lack of success in computer information systems. First was a lack of qualified data-processing personnel; and second, a lack of top management involvement in computer projects. Two symptoms of one problem - <u>a knowledge gap</u>!

Is this knowledge gap real and does it exist in the Forest Service? And for that matter, is it really necessary to educate everybody in the organization or can ADP function as a more or less autonomous unit educating only prime users.

Lous Grosenbaugh said in a recent talk, "Much of the professional skill foresters acquired in college even as recently as 10 years ago has been made obsolete by computer-generated knowledge. In the years immeiately ahead, foresters who are toounfamiliar with computers to use them intelligently will be considered subprofessionals unworthy to share in policy decisions." This is a strong statement, but we believe it basically sound for all, whether he is a forester, an engineer, staff, or what have you.

We also believe that the knowledge gap is real. For instance, two-thirds of the respondents to the Computer Understanding Questionnaire had had no training in ADP. One-sixth of the respondents said they have had no contact with ADP whatsoever. We question this latter figure, for theoretically anybody with a credit card provides raw data input to a computer and anybody receiving a pay check ulizizes computer print-out. Perhaps most respondents interpreted "contact" literally as actual physical contact with or use of the computer.

In spite of the fact that most respondents have had no training in ADP, they almost universally felt that not enough use was being made of the computer.

User support is essential for the success of any computer based system. Today's computer - based systems are imperfect, and therefore dependent on their users' support. Indifferent or hostile users can defeat a system by a number of means including passive resistance, refusing to exercise judgement in interpreting the computer's output, and following prescribed procedures blindly. Just how successfully a computer - based system will function depends a lot on whether its users possess a proprietary feeling toward it. A proprietary feeling comes with knowledge and participation.

II. Results of the Study of Computer Understanding.

The study of Computer Understanding includes results from a stratified random sample consisting of 1,537 employees - technicians and above. The sample questionnaire contained 8 questions designed to

survey attitudes, understanding and training on non-ADP personnel.
Briefly the results are:

1. Of all the returns, one-half felt that their computer train-
ing was inadequate, one-third felt that it was adequate, and the remaining
one-sixth answered that they did not know. This trend held generally
true for all levels of the organization.

2. Two-thirds of the respondents have had no training in ADP,
and 80% of these desired more training ranging from general orientation
on up through systems analysis and design.

3. Only 3% of the 1,537 returns indicated less use should be
made of the computer. In contrast about 80% said we should use it more.

4. Two-thirds felt that the computer was a good tool or critical
to their operation. Only 1 1/2% said computers were not needed.

5. Two-thirds of the entire group have had no training of any
kind, not even a general orientation towards data processing concepts.
We did find, though, that the amount of training tended to increase as
organization level increased. Regional Office employees have had more than
Forest personnel, etc. Also, researchers and engineers tended to be better
trained than the other groups.

6. Only about one-sixth claimed no contact at all with computers,
although the majority _did_ claim contact through use of computer printouts.
Those claiming non-contact were distributed in about the same proportion
throughout the organization, however, the technicians group had the largest
proportion (40%) of non-contact.

7. Understanding of ADP was based on a 2-part question. First, the respondent was asked to rate his understanding of various computer terms. The second part was a test to match terms with definitions. Of particular interest here is that over half of the engineers at the Ranger District and Forest Supervisors level did not know the definition of FORTRAN. Yet, this group should be the most familiar with computers and computer terminology within the Forest Service! Seventy-six percent of the foresters didn't know what FORTRAN was either!

Other aspects of the questionnaire dealt with qualitative judgments regarding computer usage. Since two-thirds of the respondents have had no training, we feel that their judgement may be questionable. We believe the data should be analyzed further, perhaps with respect to the two groups - those that have had experience versus those that have not.

However, for what it's worth, this is the ranking of criteria which the respondents felt should be used in putting jobs on the computer:

	More Accurate	Less Tedium	Complex Jobs	Save Money
Management	1	4	2	3
Staff	2	1	3	4

In summary, Forest Service personnel have a good attitude toward the use of computers and the desire for learning of their use, but presently there is a serious lack of training and understanding of computer applications.

III   NEED

Further use of computers in the Forest Service can be expected to increase at an even faster rate than in the past. Forecasts are for placing remote terminals at each Forest Supervisor and other major unit offices. About seven-eights of the respondents to the sample questionnaire agreed with this and said that the Forest Service should be making much greater use of computers.

Coupled with this, there is a definite knowledge gap among non-ADP personnel even at the present level of computer usage. Almost 2/3 of management and staff have had no training whatever in ADP.

It follows then that we must increase the level of knowledge among non-ADP personnel through training to avoid an even wider gap in the future. In line with this, 86% of management and 75% of staff which have received no training in any phase of ADP recognized this knowledge gap and desired to take some form of ADP training. Even among those that have received some form of training, most expressed a desire for additional training. Futhermore, over half of the respondents felt that they were inadequaltely trained for their present computer-related work.

IV   RECOMMENDATIONS

We recommend a comprehensive package of instructions be made available to all Forest Service personnel with the main objective of providing basic understanding and efficient use of computer facilities. We envision a package of five separate course which could be labeled as follows:

A.   Basic Orientation
B.   Advanced Orientation
C.   Computer Application
D.   Elementary Programming
E.   Systems Design

A. Basic Orientation should be designed to take the mystery out of computers and promote better understanding among non-ADP personnel who have not been exposed to previous orientation. The course should be mandatory for all Forest Service personnel who do not have equivalent training and who may come in contact with computer processing. This course should cover the following topics:

1) What is a computer
2) How does it work
3) Definition of program
4) Capabilities, limitation & potential
5) Basic Input/Output

The course should be completed in 4 hours or less.

B. The Advanced Orientation course should be designed to provide better understanding and more expertise in preparing data input and using computer output. This course should be oriented toward those non-ADP personnel who will be directly involved with computer processing. Some of the topics that should be included are:

1) Basic Computer Terminology
2) Fundamentals of Digital Computers
3) Computer Languages
4) Input/Output Devices
5) Hardware Costs, Capabilities
6) Software

C. The Computer Applications Course should be orientated to those people who will be prime users and who need no more than rudimentary knowledge of programming and systems design. It should be functionally orientated. This group is characterized by the researcher, most engineers, and most staff personnel in resource management functions. It should include as a minimum:

1. Basic elements of FORTRAN programming.

2. "Canned" programs available and a brief explanation of their use.

3. Simple modifications of programs - data, formats, etc.

4. System descriptions of the systems with which the professional will be most involved, such as RDS for engineers, TSA for Foresters, etc.

D. Elementary programming should be directed towards specialists with specific and unique applications who can use programming efficiently as a tool. For example, a researcher could write a simple program to solve a basic equation or an engineer could write a program to analyze stress for a particular bridge design.

The course should provide basic training in FORTRAN or COBOL, whichever is most applicable to his need.

E. Systems Design, the course, has as its objective to provide enough management know-how to allow managers to meaningfully participate in systems design without becoming professional systems designers. It must include the following:

1) Total process of systems development

2) Relationship between systems specialist and management

We recommend that all employees, clerical to top management, present and future, be required to take basic orientation. We also recommend that all professional employees and research technicians be required to take advanced orientation as part of their career development. And it is also recommended that all professional staff take computer applications and systems development.

These are broad recommendations and we recognize that, internally, adjustments must be made. Rigid training schedules are not desirable and personnel management should tailor these courses to each career ladder. We feel that basic orientation should consist of a 30-to 45-minute film. This course must reach virtually every employee in the Forest Service. A suitable film of this nature should be available from one or more computer manufacturers.

The remaining four courses should be studied and evaluated to determine whether they should be developed and conducted by an in-house group or contracted.

PROPOSED TRAINING FOR NON-ADP PEOPLE

COURSE / ORGANIZATION	BASIC ORIENTATION	ADVANCED ORIENTATION	COMPUTER APPLICATIONS	ELEMENTARY PROGRAMING	SYSTEMS DEVELOPMENT
NFA					
Forester					
Managers	X	X	X		X
Staff	X	X		O.P.	X
Engineers					
Managers	X	X	X		X
Staff	X	X		O.P.	X
Administration	X	X			
Other Professionals	X	X			
Technicians	X				
S & PF					
Foresters					
Management	X	X	X		X
Staff	X	X		O.P.	X
Others	X				
RESEARCH					
Management	X	X	X		X
Staff	X	X		O.P.	X
Technicians	X	X			

X = Required Career Development

O.P. = Optional

SECTION 4

ADP PERSONNEL MANAGEMENT PRACTICES

MEMBERS TEAM 6

NAME	TITLE	ORGANIZATION
Philip R. Haug*	Computer Systems Analyst	MAss, Berkeley
Gladys E. Bania**	Computer Systems Analyst	W.O. Div. of Adm. Mgt.
Pat Cox	Computer Specialist	Region 2
Alvin R. Walls	ADP Manager	Region 6
Paul Laidly	Biometrician	NC Station

* Team Leader   ** Recorder

TEAM OBJECTIVES

Review and analyze the summarized information on ADP personnel management practices and prepare recommendations for actions that analysis indicates are needed.

NARRATIVE PROFILE OF THE AVERAGE INCUMBENT OF EACH TITLE CLASS IN ADP

Clerk

- Fewest in number.

- Least training (average of 16 hours in last 3 years).

- Less than 6 years Forest Service.

- Five years ADP experience.

- Two years supervisory experience.

- Some college or trade school.

- Most come up through KP operation.

- Career goals: ADP operation, programming.

- Mobility - 33% willing to move.

Computer System Administrator

- Four years in grade (highest in ADP group).

- One hundred fourteen hours training in last 3 years.

  (Low for management due to rapid change in state-of-art.

  Formation experience in early years of experience.)

- Average of 14 years ADP experience.

- Several years of college or trade school.

- Goals: Management, same location.

- This group has the highest supervisory background.

- Mobility - 70% willing to move.

Computer System Operator

- One year of college or trade school.

- One hundred fifty-four hours of training in last 3 years

  (the highest of ADP group).

<u>Computer System Operator</u> - continued:

- Seven point six years in ADP, 2.5 years direct experience.

- Goal: Programmer/Systems Analyst, ADP management, but

  lack background.

- Mobility - 53% willing to move.

<u>Programmer/Analyst</u>

- Three years of college or trade school.

- Over one-third had college degrees.

- One hundred thirty-three hours of training in last 3 years.

- Eight years ADP experience. Four years direct ADP relat-

  able experience.

- Goals: Programmers to System Analyst.

  System Analysts wish to remain analysts or become managers.

- Analysts number growing 15% per year.

- Mobility - 50% willing to move.

<u>Computer Aid/Technician</u>

- One point five years of college of trade school.

- Twenty-nine hours of training in last 3 years. (Very little,

  10 hours per year.)

- Six point four years ADP experience. Three years direct

  experience.

- Goals: Operations

          Programming

- Most short-handed.

- Mobility - only 16% willing to move.

Keypunch Operator

- Six tenths years of college or trade school.

- Thirty-three hours of training in 3 years. (Very little: 11 hours per year.)

- Five years ADP experience. Four point six years direct experience.

- Goals: Operations

    Programming

- In grade 2.5 years.

- Least supervisory experience.

- Mobility - 15% willing to move.

EAM Operator

If any, should be reclassified and trained for other ADP positions.

PROFILE OF PROFESSIONAL NON-ADP

This group includes the Forester, Research Forester, Engineer,
Statistician, and others.

- Seventy-four percent did not desire to become ADP program-
  mers or analysts.

- Fifteen percent indicate they would like to enter ADP job
  classification.

- One-third of Engineers and Statisticians would enter ADP
  job classification.

- Education - college degree, with many having Master's degrees,
  53% having MS or higher. This is higher than all of ADP.

- In grade more than two years.

- Mobility - 45% willing to move.

OBSERVATIONS ABOUT THE DIFFICULTY OF FILLING ADP POSITIONS FROM A MANAGEMENT STANDPOINT AND RECOMMENDATIONS FOR SOLUTION.

Most difficult positions to fill are the Programmers/Analysts in NFS.

Most important reasons are the lack of qualified people and the lack of fund and ceiling.

Possible Solutions to ADP Staffing

a. Develop and use more inter-unit (NFS and Stations) personnel rosters. (Majority of ADP professionals and operators are willing to move.)

b. Information must go to individuals involved.

c. Ways to stop the losses of qualified personnel:

   (1) More interesting jobs (more challenging).

   (2) Better training opportunities.

   (3) Recognition.

   (4) Provide career ladder.

d. Moving

The majority of ADP Managers, Operators, and Programmers indicated they were willing to move. They may be particular as to locale and the position.

Keypunch Operators, Clerks, and Computer Aids generally do not wish to move. This is felt to be the result of (1) marital status, and (2) number and kind of career opportunities.

Conclusions

Inter-unit transfers can bring new ideas.

Conclusions (continued)

The Forest Service has not taken advantage (2%) of people (50%)
who are willing to move.

Greater emphasis on need for experience in two Regions to qual-
ify for promotion to GS-12 level might encourage more mobility.

NON-ADP PERSONNEL'S PARTICIPATION IN ADP

Has very little effect in Research. (In Research ADP activi-
ties are part of Research effort.)

Makes CONTROL of ADP very difficult in Regions. (Incomplete
systems, poor practices in design and programming.) Non-ADP
people do not coordinate with ADP.

Value of ADP skills and activities by non-ADP personnel is
not recognized in their position classification or grade
recognition.

PERFORMANCE STANDARDS FOR PROGRAMMERS AND SYSTEMS ANALYSTS

Assumption: There is no agreement in NFS or Research on standards at the present time.

In Research:

Mutual agreement between Programmer and Project Leader determines work plan.

Group work pressures dictate schedules.

Programmer must adapt to group needs.

True for analysts, too.

In NFS:

Person setting performance criteria:

- Management sets for systems analysts.
- Systems Analyst sets time and performance for programmers in consultation with programmer.

Quantity is not a measure of performance for systems analyst but quality is very important.

Conclusion:

There are no consistent non-subjective quantitative measures for programmer/analyst time and efficiency. These measures should be developed.

First steps toward this are:

1. Project costing, and

2. Formalized estimating (exists; needs wider adoption in NFS).

4-8

Recommended Performance Criteria for Systems Analyst/Programmer

1. Keeps current, reads, etc.

2. Finishes job on time. (Programmer has a strong part in setting schedule.

3. Does quality work.

   a. ADP technical excellence

   b. Meets user needs (satisfaction; helps user clarify his needs and get them).

4. Quantity (less important). (Uses time effectively; can schedule activities to meet non-controllable working conditions.) (Adaptive)

5. Innovative/Use (Introduces new techniques).

These seem to be consistent with MOHR rating CAS (Career Appraisal System). The categories in CAS seem appropriate for uniform standards if there are to be some. Some criteria might be quantified, i.e., cards/complexity for Keypunch Operators.

POSSIBLE AREAS FOR QUANTIFIED UNIFORM PERFORMANCE STANDARDS

Title	Measures of Performance	Useable by		
Keypunch Operators	Volume/Complexity Accuracy	NFS — Possibly	Research — No	S&PF — No
Clerks		NFS — No	Research — Possibly not	S&PF — Possibly not
Computer Operators	Follow runs accurately (% errors) Follow instructions Reruns, work habits	NFS — Possibly	Research — Possibly	S&PF — Possibly

RECRUITMENT SOURCES

Reasons given for difficulty in recruitment:

Lack of "qualified" applicants. Potential employee may have
unreasonable expectations.

Factors related to source:

1) Other FS Areas

    a) Limited numbers (show high interest; of those who spent
       time in ADP, a few wish to go into ADP).

    b) Bring FS knowledge.

    c) Have most opportunity for executive ADP position.

2) Outside (Universities, Other Government, Private Industry)

    a) Bring "fresh" approach

    b) Bring technical expertise

    c) Must have career ladder independent of other staff
       (within ADP)

    d) Strengthen Computer Science as a profession.

    e) More mobile.

Conclusion:

Maintain a "balance" of FS or non-FS people in ADP. At
present, we need to strengthen ADP professionalism, i.e.,
bring in Computer Scientists.

TABLE 1

FIRST AND SECOND CHOICE CAREER GOALS OF PERSONNEL WORKING IN AUTOMATIC DATA PROCESSING

Number of People by Goal and Choice

TITLE	Number of People	Production Operation 1	2	Programmer 1	2	Computer Specialist 1	2	Systems Analyst 1	2	Data Proc. Manager 1	2	Other than ADP 1	2
1 CLERK DATA PROCESSING	15	5	1	1	4	2				1		1	2
2 DATA PROCESSING MANAGER	10						1	1	2	6		3	1
3 COMPUTER SYST. OPERATOR	34	6	9	12	6	3	8	2	4	9	2		3
4 PROGRAMMER/SYST. ANALYST	80		1	2	7	26	14	16	26	30	14	3	3
5 COMPUTER AID/TECH.	25	8	4	6	5	3	4	1	1	2		1	4
6 KEY PUNCH OPERATOR	92	28	9	18	11	2	10	2			4	10	12
8 EAM OPERATOR	2	2			1								
9 FORESTER	49			1	1	4	3	3	6	1	5	37	4
10 RESEARCH FORESTER	73		1		5	5	9	3	4		2	63	
11 ENGINEER	45	3	2	2	10	8	2	1	4	2	5	28	4
12 STATISTICIAN	38	2	1	5	5	3	10	1	1	3	3	21	1
13 OTHER	96		1	3	8	6	11	2	8	3	7	75	2

TABLE 2

TOTAL MAN YEARS BY TITLE FY 67-68-69 FROM ADP MIS REPORT OF 10/25/69

Syst. Analysis & Programming	K.P./KV Operation	ADPE Operation	Total	FY
84	110	87	281	1967
99	117	67	283	1968
115	106	55	276	1969
298	333	209	840	MAN/YEARS TOTAL

Conversion to MAN DAYS by x 220 man days per man year.
(This is considered net work days after leave.)

Syst. Analyst/Programmer	–	65,560 man days in 3 year period
Key Punch Operation	–	73,260 man days in 3 year period
ADP Operation	–	45,980 man days in 3 year period
TOTAL		184,800 man days in 3 year period

TABLE 3

SUMMARY OF ADP TRAINING AND EXPERIENCE OF ADP AND NON-ADP PERSONNEL IN FOREST SERVICE

TITLE	NO. PEOPLE	AVG. YEARS IN GRADE	% TIME IN ADP	AVG YEARS EDUC. ABOVE H.S.	NUMBER ADP TRAINING COURSES (3 YRS) TOTAL #	AVG (PERSON)	HOURS OF ADP TRAINING COURSES (3 YRS) TOTAL HOURS	AVG (PER PERSON)	AVERAGE YEARS WORKED IN: F.S.	GOVT.	A.D.P.	AVERAGE YEARS EXPERI. ADP PEOPLE DIRECT (1)	INDIRECT (2)	YEARS SUPERV. EXPER. AVG.	YEARS EXPERIENCE NON-ADP PEOPLE AVERAGE PROF. ADP (3)	NON-PRO ADP (4)	OTHER ADP RELATED (5)
1 CLERK D.P.	15	1.9		.9	8	.5	240	16	4.2	6.6	4.9	1.4	1.2	2.0			
2 COMP. SYST. ADMIN	10	4.0		2.6	29	2.9	1,142	114	10.0	14.7	14.3	7.2	1.7	8.7			
3 COMP. SYST. OPERATOR	34	1.4		1.2	75	2.2	5,234	154	4.1	7.9	7.6	2.5	3.4	2.0			
4 ANALYST/PROG/SPEC	80	1.6		3.3	227	2.8	10,617	133	6.7	10.0	8.0	3.8	3.4	3.5			
5 COMP. AID/TECH	25	1.6		1.5	22	.9	728	29	4.8	6.2	6.4	3.1	3.1	4.8			
6 CARD PUNCH OPER.	93	2.6		.6	34	.4	3,064	33	3.5	5.6	5.1	4.6	.2	.6			
8 EAM OPERATOR	2	8.5		1.0	3	1.5	135	67	5.5	13.5	15	12.5	1.2	10.0			
9 FORESTER	50	2.8	27	5.0	95	1.9	4,336	87	13.7	14.4	4.8				2.3	.2	1.6
10 RESEARCH FORESTER	73	2.5	27	6.7	75	1.1	2,800	38	9.8	10.9	6.0				2.2	.4	1.5
11 ENGINEER	45	2.6	42	4.3	60	1.3	2,057	46	7.0	9.4	5.2				1.3	.6	1.1
12 STATISTICIAN	38	1.8	52	4.8	58	1.5	1,238	33	8.1	10.1	7.6				2.3	1.0	2.0
13 OTHER	96	1.9	21	6.0	143	1.5	4,880	51	6.4	7.4	4.6				1.2	.4	1.3

(1) THESE TERMS DEFINED ON ATTACHED SHEET
(2) " " " " " "
(3) " " " " " "
(4) " " " " " "
(5) " " " " " "

NOTE: TOTAL OF DIRECT & INDIRECT ADP EXPERIENCE DOES NOT AGREE WITH TOTAL YEARS WORKED IN ADP SINCE NOT ALL ADP EXPERIENCE IS CONSIDERED TO BE PARTICULARLY BENEFICIAL TO PERFORMANCE IN A GIVEN TITLE.
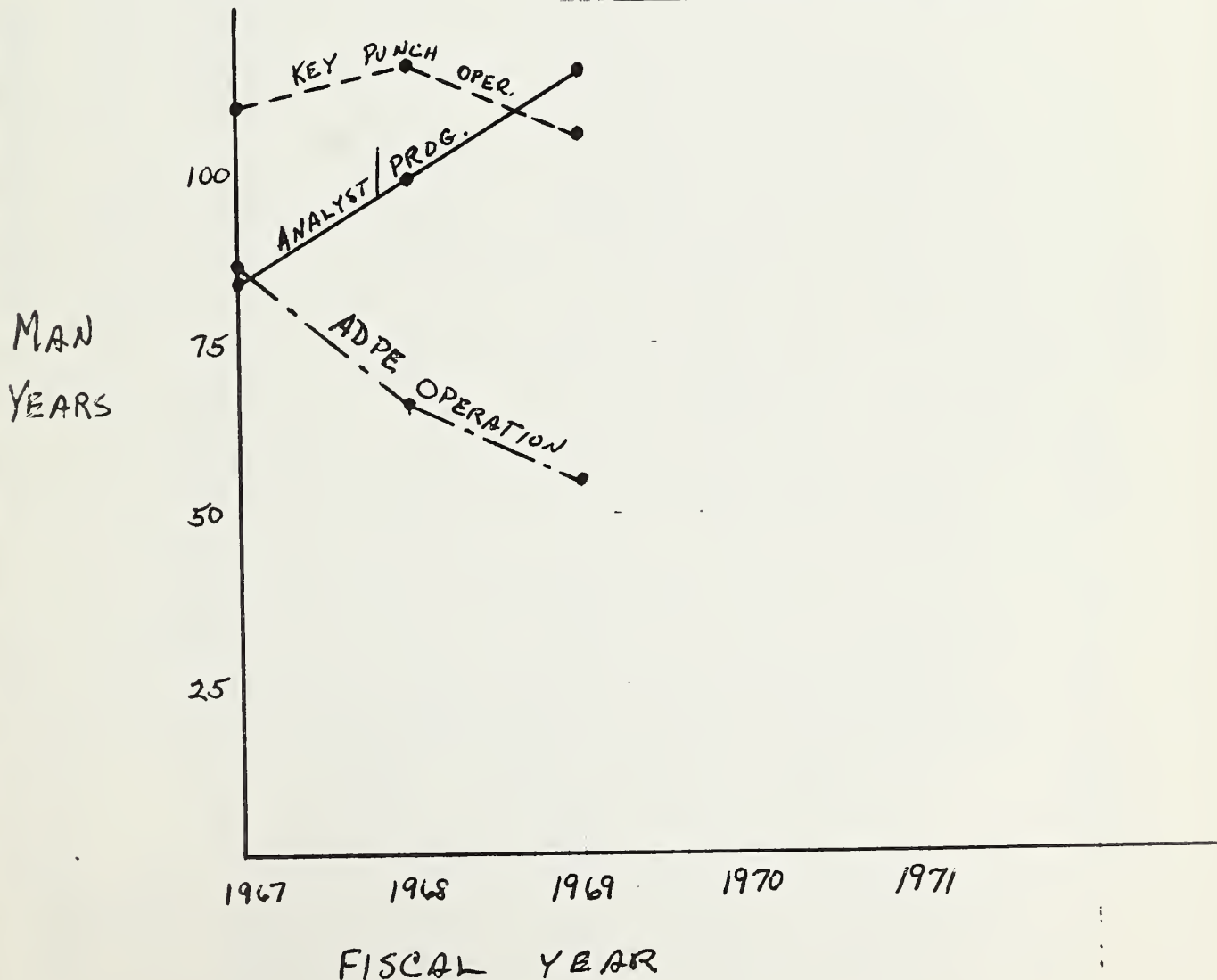
TABLE 3 (Cont'd)

| TITLE | NO. PEOPLE | | EDUCATION AVG. YEARS ABOVE H.S. | | EXPERIENCE ADP PEOPLE - AVERAGE YEARS | | | | EXPERIENCE of NON-ADP PEOPLE AVERAGE YEARS | | | | | | SUPERVISORY EXPERIENCE AVG. YEARS | |
| | | | | | DIRECT | | INDIRECT | | NFS | | | RES. | | | | |
	NFS	RES	N.F.S.	RES.H.	NFS	RES	NFS	RES	PROF. ADP	NON-PRO ADP	OTHER	PROF ADP	NON-PRO ADP	OTHER	NFS	RES.
1 CLERK, D.P.	12	3	.9	1.0	1.5	1.1	1.5	-							1.6	3.7
2 COMP. SYST. ADMIN.	8	1	3.3	-	6.8	-	2.2	-							8.6	-
3 COMP. SYST. OPERATOR	30	3	1.2	1.7	2.7	1.2	3.3	4.7							2.1	1.7
4 ANALYST/PROG.	49	24	3.0	4.1	3.4	4.2	3.5	2.8							3.0	3.5
5 COMP. AID/TECH	21	3	1.5	1.7	2.9	.5	3.5	1.2							5.0	.3
6 CARD PUNCH OPER.	82	6	.5	.8	3.9	7.6	.2	-							.7	-
8 EAM OPERATOR	1	1	2.0	-	23.5	1.5	-	2.5							20.0	-
9 FORESTER	29	9	4.7	5.7					.9	.1	2.4	6.3	.5	.3	-	-
10 RESEARCH FORESTER	-	68	-	6.6					-	-	-	1.8	.4	1.5	-	-
11 ENGINEER	25	13	3.4	6.7					.6	.4	1.9	1.8	1.0	.1	-	-
12 STATICION	3	34	4.3	4.9					.5	.7	.5	2.5	1.0	.1	-	-
13 OTHER	19	69	5.6	5.7					.3	.1	1.9	1.5	.5	.6	-	-

DEFINITION OF TERMS USED ON TABLE 3 - EXPERIENCE -

(FOR ADP PEOPLE)

TERM DEFINED UNDER EACH TITLE	CLERK DATA PROC	CS. ADMIN	C.S OPERATOR	ANALYST PROGRAMMR	COMP. AID TECH	CAR. PUNCH OPERATOR	EAM OPERATOR
DIRECT EXPERIENCE	CLERK D.P.	C.S. ADMIN.	C.S.OPERATOR	ANALYST PROGRAMMR COMP SPEC.	EAM OPERATOR C.S.OPERATOR AID/TECH EAM PROJ. PLAN	CARD PUNCH OPERATOR	EAM OPERATOR EAM PROJ PLAN
INDIRECT EXPERIENCE	CARD PUNCH OPERATOR	ANALYST PROGRAMMER COMP SPEC. COMP.INSTR.	EAM OPERATOR COMP. AID/TECH EAM PROJ. PLAN	EAM OPERATOR C.S.OPERATOR COMP.AID/TECH C.S. ADMIN. COMP. INSTR.	CLERK D.P. CARD PUNCH OPERATOR	CLERK D.P.	CARD PUNCH OPERATOR

FOR NON-ADP PEOPLE · EXPERIENCE

TERMS USED	TITLES CONSIDERED TO BE INCLUDED.

PROFESSIONAL ADP - PROGRAMMER, COMPUTER SPECIALIST, SYSTEMS ANALYST, COMP. SYST. ADMIN., COMPUTER INSTRUCTOR EAM PROJECT PLANNER

NON-PROFESSIONAL ADP - CLERK DATA PROC., CARD PUNCH OPERATOR, EAM OPERATOR, COMPUTER OPERATOR, COMP. AID/TECH.

OTHER ADP RELATED - STATISTICIAN, RESEARCH USER, ADP COORDINATOR, ENGINEER-TIMBER OR OTHER USER

TABLE 4

GAINS AND LOSSES IN DP PERSONNEL COMPARED WITH AUTHORIZED STAFFING

		Changes in Number or Percent of People by Title						
	DP Clerk	Dig. Comp. Syst. Mgr.	Operator	Syst. Anal. /Prog.	Computer Aid/Tech.	Card Punch Operator	EAM Operator	Total
Beginning of Period Staffing	11	8	23	76	23	110	17	267
Present Authorized Staffing	13	10	31	94	42	107	7	304
Percent Increase or Decrease in staffing	18	25	35	25	83	-3	-59	14
Total Losses	13	1	27	32	7	136	12	228
Total Gains	15	3	36	51	26	133	2	265
Turnover	36%	4%	33%	13%	7%	42%	33%	27%

TABLE 5

WILLINGNESS OF ADP AND NON-ADP PERSONNEL TO MOVE

TITLE	Report-ing	Number of People WILLING TO MOVE	NOT WILLING TO MOVE	UNDECIDED
1 CLERK DATA PROCESSING	15	5	8	2
2 DATA PROCESSING MANAGER	10	7		3
3 COMPUTER SYST. OPERATOR	34	18	11	5
4 PROGRAMMER/SYST. ANALYST	80	40	18	22
5 COMPUTER AID/TECH.	25	4	8	13
6 KEY PUNCH OPERATOR	92	14	51	27
8 EAM OPERATOR	2	1	1	
9 FORESTER	49	27	9	13
10 RESEARCH FORESTER	73	25	25	23
11 ENGINEER	45	21	10	14
12 STATISTICIAN	38	14	15	9
13 OTHER	96	50	22	24

CONCLUSIONS CONCERNING THE TURNOVER OF ADP PERSONNEL

1. Low number of within-FS ADP transfers.

2. Most of personnel hired within FS except:

   Keypunch Operators - 72% outside Government
                        94% outside Forest Service

   Computer Operators - 46% outside Government
                        63% outside Forest Service

3. Greatest number of losses occur among Keypunch Operators,

   Systems Analyst/Programmers, and Operators.

4. Keypunch Operators are the highest turnover group.

5. Regarding losses, there is a 12% shortage of Programmers

   and Analysts, and demand is growing at the rate of 15% a

   year. Fifty-seven percent of loss is due to leaving Forest

   Service and Government.

6. Turnover problems are related to lack of adequate grade

   structure and career ladders.

   Feel Forest Service is used as training ground. Local

   conditions can provide exceptions.

   Job design important in maintaining interest to keep

   personnel.

   Need more publicity on how, when, and where to file

   for Federal jobs.

RECOMMENDATIONS

1. Develop career ladders within ADP, particularly for ADP pro-
    fessionals and non-professionals. These should be flexible,
    should go beyond ADP (either within FS management or outside
    FS). They should cross into other units and functional lad-
    ders. These career ladders should be developed soon.

2. Develop and use training programs for technical user people
    to allow them to effectively communicate with ADP.

3. Increase training for ADP managers, analysts. Current hours
    in training are considered below what is needed to keep up.
    More funding needed. ADP professionals should consider more
    professional ADP organization membership--attend seminars.

4. Take steps to improve job design for programmer/analyst
    (working environment, and variety of job assignments).
    a) More interregional transfers (broader experience)
    b) More use of advanced techniques, machines (particu-
        larly in NFS)
    c) Terminals, graphics, software packages.

5. Consider retraining and reclassifying EAM operators for such
    positions as computer aid or technician. They may be in an
    outdated position. Keypunchers and clerks should also be
    trained to permit career development.

6. In cooperation with CSC, advise computer schools, colleges, and universities of career opportunities in Forest Service ADP and requirements for entering this field.

7. Make more use of inter-unit rosters for programmers, analysts, and operators for promoting 9's and 11's. This will

   a) Bring in new ideas

   b) Provide more opportunities for advancement

   Disadvantages:

   a) Removes local knowledge

   b) Might cost more

8. Recognize journeyman programmer level to at least GS-11's.

9. Take advantage of incentives, i.e., awards, quality step increases, etc.

10. More use of automatic programming aids, aids to increase productivity of ADP people. Involves -

    a) Decision Table Processors

    b) Generalized Information Retrieval Processor

    c) Automatic Flowcharting

    d) Advanced Programming Language--Simscript, PL/1, APL, etc.

    e) Simulation models (SCERT, CASE)

11. Uniform standards for performance and position descriptions.

11. (Continued)

Performance standards should agree with and help in use of
(CAS) Career Appraisal System being initiated under MOHR.
Some standards may not apply to both Region and Station
needs. Uniform enforced standards for program documenta-
tion needed first. Training of classifiers in ADP jobs
needed. Benchmark or "canned" job descriptions would help.
W.O. should do this.

12. Bring in more Computer Scientists. This will help maintain
a balance between Forest Service and outside talent and help
bring professionalism to ADP in the Forest Service.

13. Increase use of details for career development, particularly
for professions which dislike moving.

14. Give consideration to having 2 unit experience requirement
for GS-13 and above positions.

SECTION 5

TRAINING OF ADP PEOPLE

MEMBERS TEAM 4

NAME	TITLE	ORGANIZATION
Leslie M. Oliphant *	ADP MANAGER	Region 5
D. Ross Perry **	Computer Systems Analyst	WO – Natl. Fin. Off.
William W. Barton	Forester	NE Area S & PF
David P. Blodget	ADP Manager	Region 1
Hans T. Schreuder	Station Biometrician	SE Station

　　　　* Team Leader　　** Recorder

TEAM OBJECTIVES

   Review and analyze the summarized information on training of ADP
personnel and prepare recommendations for action that analysis
indicates is needed.

WORKSHOP TEAM QUESTION - I

Has the F. S. training in ADP been directed toward the areas where training is most needed?

Comments:

1.   Not in cross training between Regions.

2.   Not in ADP Management - specific to ADP management.

3.   There is no standardization of training in ADP.

4.   There is not enough training directed toward advancement in fields that are not in the specific working field of the person.

ANSWER:

There are needs for:

1.   Definitions of computer personnel ADP skills.
2.   Standardization of training needed by each skill class.
3.   A good system of cross communication between field units.

More stress needed on staffing and training systems analysts.

A detail should be set up involving persons knowledgeable in the ADP field to develop individual standards of training for each job category.   These standards should be published in the FSH.

Need less emphasis on generalized training, more emphasis on effective training of individuals and small groups.   Need to consider more in-service training in interest of meeting FS-oriented needs, gaining better control of course content, and reducing training costs.

WORKSHOP TEAM QUESTION - II

What effect is manufacturer unbundling (separate pricing if training
is conducted by equipment vendor) expected to have on the cost of
F. S. ADP training? Based on past experience and expressed in a per-
cent increase in cost.

Comments:

1.   Will not take courses we do not need.

2.   Will attend better training course rather than go to the free
course offered by the manufacturer.

3.   Will not have people attending free classes who do not belong
there.

4.   Will have more in-house courses.

5.   Will have more control over course content.

ANSWER:

We will seek better training for the money expended.

Based on expected trend toward more efficient use of training,
there will probably be little increase in net cost of training.
Though data base for in-service training is fragmentary, there will
be some cost savings from increased use of this method.

WORKSHOP TEAM QUESTION - III

Has the F.S. expenditure for training in ADP been reasonable in
view of total costs and potentials in this field? (Consider both
percentage of time spent in training and cost of formal courses.

Comments:

1.   Training could have been better planned.

2.   Could have received more for the money expended.

3.   Training cost was approximately 3% of overall ADP expenditures,
and approximately 6% of ADP salary expenditures.

The test of training is not in "reasonableness" of expenditures,
but rather in whether or not the training met the goals and/or
objectives of the training, provided the cost is reasonable.

WORKSHOP TEAM QUESTION - IV

What conclusions can be made about the general level of training
and experience of F. S. ADP personnel?

Comments:

Generally substandard.

Need standardized training programs for various positions.

Need coordinated training programs within and between units.

Need special studies to develop training guidelines, coordination
of training and experience programs to reduce inequities, improve
working environment.

Generally low in experience and in specific courses.

The tables do not give a clear picture as to whether the training
shown is applicable to the job assignment under which this training
is recorded.

Training in Systems Analysis is inadequate.

Training specifically related to ADP management as opposed to general
management is very limited.

Hours of training for purposes of keeping current as well as for
learning new material is low.

General level of training is low, especially Systems Analysts and
management of ADP operations.

Experience low except production supervisors and EAM.

Training potential has not been properly utilized.

WORKSHOP TEAM QUESTION - V

Provide a brief narrative profile of the average incumbent of each
ADP title class (lines 1 - 6 of Table 9). (Describe grade, educa-
tion, training, work experience, etc.

Based upon your experience and the information furnished, what is be-
lieved to have the effects of each title class personnel's experi-
ence and training on the ADP program?

Comments:

The turnover of programmers is not necessarily high. It varies by
time and place and they are generally hard to come by.

Any conclusions developed from the averages of such diversified
areas and situations could be misleading.

Keypunch turnover varies from place to place - R-4 has a rather
low turnover in an area where there is a demand for keypunch oper-
tors from other Federal Agencies.

WORKSHOP TEAM QUESTION - VI

What is the relationship between training of ADP personnel and the
employees career goals?

Does the information on career goals show up any significant pro-
blems that should be considered in connection with training of ADP
personnel?

Comments:

Many of the employees do not have the training necessary to meet
their career goals.

There appears to be a lack of orientation on required standards
for certain positions.

There appears to be a significant need for orientation and consul-
tation of the lower grade employees.

TABLE 9
SUMMARY OF ADP TRAINING AND EXPERIENCE OF ADP AND NON-ADP PERSONNEL IN FOREST SERVICE.

TITLE	No. People	AVG. YEARS IN GRADE	% TIME IN ADP	AVG YEARS EDUC. ABOVE H.S.	NUMBER ADP TRAINING COURSES (3 YRS) TOTAL #	AVG (PERSON)	HOURS OF ADP TRAINING COURSES (3 YR) TOTAL HOURS	AVG. PER PERSON	AVERAGE YEARS WORKED IN: F.S.	GOVT.	A.D.P.	AVERAGE YEARS EXPERIENCE ADT PEOPLE DIRECT ①	INDIRECT ②	YEARS SUPERV. EXPER. AVG.	YEARS EXPERIENCE NON-ADP PEOPLE AVERAGE PROF. ADP- ③	NON-PRO ADP ④	OTHER ADP RELATED ⑤
1 CLERK D.P.	15	1.9		.9	8	.5	240	16	4.2	6.6	4.9	1.4	1.2	2.0			
2 COMP. SYST. ADMIN	10	4.0		2.6	29	2.9	1,142	114	10.0	14.7	14.3	7.2	1.7	8.7			
3 COMP. SYST. OPERATOR	34	1.4		1.2	75	2.2	5,234	154	4.1	7.9	7.6	2.5	3.4	2.0			
4 ANALYST/PROG/SPEC	80	1.6		3.3	227	2.8	10,617	133	6.7	10.0	8.0	3.8	3.4	3.5			
5 COMP. AID/TECH	25	1.6		1.5	22	.9	728	29	4.8	6.2	6.4	3.1	3.1	4.8			
6 CARD PUNCH OPER.	93	2.6		.6	34	.4	3,064	33	3.5	5.6	5.1	4.6	.2	.6			
8 EAM OPERATOR	2	8.5		1.0	3	1.5	135	67	5.5	13.5	15	12.5	1.2	10.0			
9 FORESTER	50	2.8	27	5.0	95	1.9	4,336	87	13.7	14.4	4.8				2.3	.2	1.6
10 RESEARCH FORESTER	73	2.5	27	6.7	78	1.1	2,800	38	9.8	10.9	6.0				2.2	.4	1.5
11 ENGINEER	45	2.6	42	4.3	60	1.3	2,057	46	7.0	9.4	5.2				1.3	.6	1.1
12 STATISTICIAN	38	1.8	52	4.8	58	1.5	1,238	33	8.1	10.1	7.6				2.3	1.0	2.0
13 OTHER	96	1.9	21	6.0	143	1.5	4,880	51	6.4	7.4	4.6				1.2	.4	1.3

① THESE TERMS DEFINED ON ATTACHED SHEET
② " " " " " "
③ " " " " " "
④ " " " " " "
⑤ " " " " " "

NOTE: TOTAL OF DIRECT & INDIRECT ADP EXPERIENCE DOES NOT AGREE WITH TOTAL YEARS WORKED IN ADP SINCE NOT ALL ADP EXPERIENCE IS CONSIDERED TO BE PARTICULARLY BENEFICIAL TO PERFORMANCE IN A GIVEN TITLE.

TABLE 9 (cont'd)

TITLE	NO. PEOPLE		EDUCATION AVG. YEARS ABOVE H.S.		EXPERIENCE ADP PEOPLE - AVERAGE YEARS				EXPERIENCE OF NON-ADP PEOPLE AVERAGE YEARS						SUPERVISORY EXPERIENCE AVG. YEARS	
					DIRECT		INDIRECT		NFS			RES.				
	NFS	RES	N.FS.	RESH.	NFS	RES	NFS	RES	PROF. ADP	NON-PRO ADP	OTHER	PROF ADP	NON-PRO ADP	OTHER	NFS	RES.
1 CLERK, D.P.	12	3	.9	1.0	1.5	1.1	1.5	-							1.6	3.7
2 COMP. SYST. ADMIN.	8	1	3.3	-	6.8	-	2.2	-							8.6	-
3 COMP. SYST. OPERATOR	30	3	1.2	1.7	2.7	1.2	3.3	4.7							2.1	1.7
4 ANALYST/PROG.	49	24	3.0	4.1	3.4	4.2	3.5	2.8							3.0	3.5
5 COMP. AID/TECH	21	3	1.5	1.7	2.9	.5	3.5	1.2							5.0	.3
6 CARD PUNCH OPER.	82	6	.5	.8	3.9	7.6	.2	-							.7	-
8 EAM OPERATOR	1	1	2.0	-	23.5	1.5	-	2.5							20.0	-
9 FORESTER	29	9	4.7	5.7					.9	.1	2.4	6.3	.5	.3	-	-
10 RESEARCH FORESTER	-	68	-	6.6					-	-	-	1.8	.4	1.5	-	-
11 ENGINEER	25	13	3.4	6.7					.6	.4	1.9	1.8	1.0	.1	-	-
12 STATICIAN	3	34	4.3	4.9					.5	.7	.5	2.5	1.0	1.9	-	-
13 OTHER	19	69	5.6	5.7					.3	.1	7.9	1.5	.5	.6	-	-

DEFINITION OF TERMS USED ON TABLE 9 — EXPERIENCE —

(FOR ADP PEOPLE) TERM DEFINED UNDER EACH TITLE	CLERK DATA PROC	C.S. ADMIN	C.S OPERATOR	ANALYST PROGRAMMER	COMP. AID TECH	CARD PUNCH OPERATOR	EAM OPERATOR
DIRECT EXPERIENCE	CLERK D.P.	C.S. ADMIN.	C.S.OPERATOR	ANALYST PROGRAMM COMP. SPEC.	EAM OPERATOR C.S.OPERATOR AID/TECH EAM PROJ. PLAN.	CARD PUNCH OPERATOR	EAM OPERATOR EAM PROJ PLAN.
INDIRECT EXPERIENCE	CARD PUNCH OPERATOR	ANALYST PROGRAMMER COMP. SPEC. COMP.INSTR.	EAM OPERATOR COMP. AID/TECH EAM PROJ. PLAN	EAM OPERATOR C.S. OPERATOR COMP AID/TECH C.S. ADMIN. COMP. INSTR.	CLERK D.P. CARD PUNCH OPERATOR	CLERK D.P.	CARD PUNCH OPERATOR

FOR NON-ADP PEOPLE · EXPERIENCE — TERMS USED	TITLES CONSIDERED TO BE INCLUDED ·

PROFESSIONAL ADP — PROGRAMMER, COMPUTER SPECIALIST, SYSTEMS ANALYST, COMP. SYST. ADMIN., COMPUTER INSTRUCTOR, EAM PROJECT PLANNER

NON-PROFESSIONAL ADP — CLERK DATA PROC., CARD PUNCH OPERATOR, EAM OPERATOR, COMPUTER OPERATOR, COMP. AID/TECH.

OTHER ADP RELATED — STATISTICIAN, RESEARCH USER, ADP COORDINATOR, ENGINEER-TIMBER OR OTHER USER

WORKSHOP TEAM QUESTION - VII

What has been the Forest Service's expenditures (in time and money)
on less than fully effective training?

Comments:

42% of the courses were reported as being less than fully effective
(Table 14).

WORKSHOP TEAM QUESTION - VIII

Which of the problems stated in Tables 15 and 16 are significant
and valid for service-wide consideration?

List and answer any other significant problems concerning training
of ADP personnel.

Comments:

Many of the problems (Table 15) could be summarized under "lack
of support" which in turn stems in part from lack of standardized
training needs.

Users have legitimate complaint in lack of understanding - need more
user training in ADP.

Need more appropriate courses oriented to Forest Service ADP re-
quirements.

Table 16 indicates that training has been poor and that management
has not supported ADP training to the extent needed.

A great variety of people have reported problems with training.

TABLE 14

Employee-Ranked Usefullness of Training Courses
Received During 3 Years Ending 6/30/69
From Form VI

Unit	None	Some	Much	Total
R-1		20	23	43
2		20	17	37
3	1	9	18	28
4		31	64	95
5	7	17	20	44
6	14	27	30	71
8	2	7	24	33
9		11	16	27
10		1	3	4
22 INT		6	11	17
23 NC	2	21	29	52
24 NE		21	26	47
26 PNW		10	17	27
27 PSW	7	40	77	124
28 RM	1	6	8	15
29 SE		13	22	35
30 SO		1	15	16
32 FPL		26	12	38
41 SA		3	5	8
5- WO	5	26	63	94
Total Service	39	316	500	855
%	5%	37%	58%	100%

5-10

TABLE 15

Problems in Obtaining Necessary Training for Data

Processing Personnel As Reported by Unit ADP Managers

Problems	Units
1. Availability of appropriate courses in working area	01,02,03,04,05,06, 08,10,FPL
2. Scheduling of courses versus workload demands	03,04,06,08,09,WO, NC,NE,PNW,SE,SO
3. Course content inadequate	03,05,06
4. Travel time and expense limitations	04,06,09,10,NC
5. Cost of course	03,10,FPL,NC
6. Lack of management support for meeting training needs	01,04
7. Personnel turnover and resultant new training demands	08
8. No problem to date	INT,PSW,RM

TABLE 16

Problems related to training submitted by more than one individual
for consideration by computer systems study team.

Organizational Units	Positions Reporting	Problems
01, 02	Hydrologist, Engineer	Need better understanding of computer methods, capabilities.
01, 03, 04, 05, 06, 08, 09, 10, NC, PNW, PSW, RM, WO	DP Clerk, Comp. Syst. Operation, Syst. Analyst/ Prog., Comp. Aid, CPO, Forester, Engineer, Hydrologist	Need more ADP training (on the job or formalized, for advancement, in special areas, for field users, for functional specialists, in computer use, for general orientation).
02, NC, NE, PSW, SE, SO, WO	Comp. Syst. Anal. Syst. Analyst/ Prog., Plant Ecol., Forestry, Forest Prod. Technol., Statistician	Need more trained ADP people

TEAM OBJECTIVES

Pinpoint key facts about Forest Service computer-related training
of ADP personnel that are significant from an overall management
standpoint. Develop preliminary recommendations regarding direction
and specific actions needed in the training of Forest Service ADP
personnel.

Key facts significant from an overall management standpoint --

- ADP managers believe (Table 1) certain training, differing by
  job category, is basic and necessary for the Service to be able
  to make effective use of limited manpower.

- ADP personnel feel, and DP managers agree, that continuing train-
  ing is needed for them to keep abreast in the rapidly evolving
  ADP field, and for them to be able to develop to their full poten-
  tial and career aspirations (Table 13).

- ADP managers in some areas report barriers to getting needed ADP
  training because local management fails to support necessary al-
  location of funds, time and travel to obtain such training
  (Table 15). Other local management apparently supports these
  endeavors. This leads to inconsistency in development of per-
  sonnel by skill classes from unit to unit.

- All units reported either lack of availability of appropriate
  ADP training courses, or course content being less than adequate
  to achieve training objectives (Table 15). However, some units
  have utilized a number of different courses (Table 5 and Informa-
  tion Source F) indicating the problem may be related more to lack
  of information on course availability and effectiveness than to
  lack of availability. Again there was much variability among
  units in number of courses utilized and number of persons trained.

- ADP employees reported training courses to have been of limited
  usefulness in 37% of the courses taken and to have been of no
  use in 5% of the courses taken.

- The level of training and education in the professional dis-
  ciplines of ADP appears to be lower than the levels of other
  professionals in the Forest Service (Table 9).

- Many ADP personnel and others indicating an interest in ADP
  careers appear to be setting unrealistic goals for themselves
  (Table 13). This indicates a need for understanding of the
  basic requirements involved in each position in ADP.

TABLE 1

Training Most Needed by Job Category

Job Category	Training Needed
Card Punch Operator	Knowledge of Systems they are supporting; advanced keypunching technique; tabulating and sorting skills; background training in data generation and user; improved attitude toward need for accuracy; training details in related work areas.
Computer Operator	Data communications; hardware/software orientation and basic concepts; DP fundamentals and operations; organization of work; supervisory training.
Computer Programmer	Working knowledge of resource terminology; advanced programming techniques including use of flow charts, decision logic tables, simulation, latest hardware and software developments; statistical methods and mathematics; systems analysis training; preparation of programs for multi-computer use; data communications.
Systems Analyst /Specialist	Working knowledge of resource terminology; management training including analysis techniques, communications, use of program libraries; improved knowledge of work being supported; statistical methodology; remote systems design.

TABLE 1 (Cont'd.)

Job Category	Training Needed
Computer Aid or Technician	Working knowledge of resource terminology; systems operation; DP fundamentals; training details in related work areas; organization of work.
Computer Manager	Improved knowledge of FS programs, objectives, management needs; ADP management; additional training in personnel management, communications, public relations; information retrieval, simmulation techniques; developing service function attitude.

TABLE 5

Number of Training Courses Utilized by Forest Service Units

Unit	No. Courses	Unit	No. Courses
NE	24	SO	8
NC	22	01	7
SE	21	NA	5
04	19	WO	5
08	18	PNW	4
PSW	16	06	4
RM	12	10	3
FPL	11	INT	0
09	10	ITF	0
03	10	SA	0
02	8	Total	215
05	8		

TABLE 13

FIRST AND SECOND CHOICE CAREER GOALS OF PERSONNEL WORKING IN AUTOMATIC DATA PROCESSING

TITLE	NUMBER OF PEOPLE	Number of People by Goal and Choice											
		PRODUCTION OPERATION		PROGRAMMER		COMPUTER SPECIALIST		SYSTEMS ANALYST		DATA PROC. MANAGER		OTHER THAN ADP	
		1	2	1	2	1	2	1	2	1	2	1	2
1 CLERK DATA PROCESSING	15	5	1	1	4	2				1		3	1
2 DATA PROCESSING MANAGER	10						1	1	2	6			3
3 COMPUTER SYST. OPERATOR	34	6	9	12	6	3	8	2	4	9	2		3
4 PROGRAMMER/SYST. ANALYST	80		1	2	7	26	14	16	26	30	14	3	3
5 COMPUTER AID/TECH.	25	8	4	6	5	3	4	1	1	2		1	4
6 KEY PUNCH OPERATOR	92	28	9	18	11	2	10	2			4	10	12
8 EAM OPERATOR	2	2			1								
9 FORESTER	49			1	1	4	3	3	6	1	5	37	4
10 RESEARCH FORESTER	73		1		5	5	9	3	4		2	63	
11 ENGINEER	45	3	2	2	10	8	2	1	4	2	5	28	4
12 STATISTICIAN	38	2	1	5	5	3	10	1	1	3	3	21	1
13 OTHER	96		1	3	8	6	11	2	8	3	7	75	2

<u>Training Recommendation - 1</u>

1. We recommend that a service-wide training policy or guide-
line be established to outline specific training standards (minimum
training, experience) for each **separate** discipline of ADP. These
standards will set the following:

     a.   Minimum levels of experience, education and training
          each job in ADP should have.
     b.   Acceptable courses in subject matter fields and guide-
          lines for evaluation of completion.
     c.   Creditable sources of training courses.
     d.   A means of evaluating and incorporating into these stand-
          ards any changes and new developments in the ADP field.

<u>Training Recommendation - 2</u>

It is recommended that a program or plan be developed for the dis-
semination of information on and sharing of training facilities,
courses, conferences, technical meetings, techniques. This need
becomes particularly important in the area of training of ADP
managers. This need is brought out in an analysis of Table 1 and 15.

The intent of this formal sharing of information and interchange of
ideas is to, primarily, help prevent the duplication of effort in
both training and the development and testing of new ideas. In
addition, by sharing and combining such things as training and new
ideas, a better planned and executed product can be realized.

One recommended requirement would be for periodic meetings between
ADP management personnel and between Regional Production, Systems
Analyst and Programming Chiefs. These meetings should be held at
least semi-annually at one of the Regions or Stations to attack a
specific problem or run on a firm agenda. Attendance at National
professional and ADP section meetings should be encouraged.

The workshop team recommends strong management support and emphasis be given to accelerating training and development of Computer Systems Analyst capability, both in numbers and in sophistication. Need for special attention in this area, involving some sharper definition of what systems analysis encompasses, is indicated by the following quotes from users:

1.   "Need an expert in the Forest Service to show us how specifically we can do some of our jobs better by using the computer."

2.   "Send a real experienced expert to sit down a few moments with Forest staff and review with us the working problems."

3.   "Far too many of us blame the machine when we don't understand the results or input requirements."

4.   "I feel that there are too many printouts being distributed to many levels which do not need the information."

5.   "Get the system down so that the people furnishing the raw data save time, cut down on repetitious material, and can use the printed material easier."

6.   "We spend too much time coding and decoding information."

7.   "An extra push should be made to get land resources data on computer - such as Ranger analysis - Compartment examination - stream inventories, etc."

8.   "Programming should be such that it fits the needs of the using field personnel. It appears that too often field personnel have to adjust to the program or output."

9.   "I believe we are presently far behind in systems analysis with the aid of computers."

10.   "In our local experience, computerization has taken more time, caused more frustration, and often times been less accurate and reliable."

11.   "We can get a great deal of good from computers -- however, it appears that some people want to do many jobs by computer merely because it is the "thing to do" regardless of whether it will save time or money."

12.   "Computer utilization must be evaluated continually."

13.   "I have been informed that computers have been put in use without sufficient work to do to justify them."

ADP Managers, Programmers, Systems Analysts in ADP should be considered as professionals subject to the opportunities of service wide transfer to broaden their field of training and experience and to further their careers in ADP. These professionals need to participate in professional societies to broaden and keep knowledge current.

SECTION 6

ADP OPERATIONS MANAGEMENT

TEAM 1

NAME	TITLE	ORGANIZATION
Ronald R. DeClark*	Computer Systems Analyst	WO Div. of Adm. Mgt.
Gary Beamer **	ADP Branch Chief	Region 3
Thomas Stevenson	Computer Systems Analyst	Region 4
Wencil W. Wlodarczyk	Computer Programmer	Forest Products Lab.

  * Team Leader   ** Recorder

TEAM OBJECTIVES

Review and analyze the information and statistics gathered by the
Computer Systems Study Team pertaining to ADP Operations Management
Prepare a written report of conclusions and recommendations that the
analysis indicates as needed.

TEAM APPROACH

The overall approach taken by Team 1 consisted of the following 8 steps:

1. Individual reviews of all information provided in the team study package.

2. Joint session to outline study approach and jointly review all material.

3. Group discussion of the tentative areas suggested for team recommendations and team questions.

4. Group discussion and selection of assigned areas for each team member.

5. Group review of all areas of consideration providing each of the team members with basis for preparing an outline of tentative content of final team recommendations.

6. Joint review and revision of the proposed outlines.

7. Individual preliminary development of areas considered.

8. Joint review and finalizing of team recommendations.

TEAM QUESTIONS

Question I - Standards -

What conclusions can be drawn from use or lack of use of ADP standards and procedures in Forest Service ADP units?

A. Qualification

    None

B. Answer

    1. The units (primarily Regions) having their own medium sized
        computers have through voluntary or involuntary means adopted
        written documentation standards plus programming, systems,
        and operating procedures.

        As support for this situation there are several factors which
        dictate standardization.

        a. Need ability to control work output in a production
            type environment.

        b. Need ability to allow continuance of work in spite of
            personnel changes.

        c. Because of the variety of users and their lack of ADP
            experience, some controls are required to insure that
            they define just what they want, and do in fact get
            that which will serve them best. The end product may
            not be what they originally wanted but will better serve
            their needs.

        d. Need for units to more easily implement work from
            other units.

        e. Need for easier and more efficient maintenance of
            computer applications.

        f. Need to protect investment in computer programs in
            spite of personnel changes and losses plus protect them
            through possible changes in computing hardware and
            software.

                                6-3

2. The units doing research have not felt the need or pressures
   to thoroughly control and document their computer applications
   in a standard manner.
   This is a result of the general nature of the research
   environment which would include these points.
   a. Preponderance of one shot type of computer programs.
   b. The computer is used more as an analytical tool for
      generating supportive material for the project work
      rather than in the Regions where the computer use is
      primarily in the area of providing working tools for
      land managers and staff personnel.
   c. Research personnel don't feel the need generally
      (and there is little need usually) for program
      documentation or other standardization in the use of
      computers.
3. It seems likely that as the research organizations move up to
   larger computers they will adopt additional procedures to aid
   in the management of their data processing (computing).
   This is a natural result of moving into a more complex
   management situation. As the complexity of the elements
   increases, the greater the need for functional procedures by
   which to get work done through people.

C. SUMMARY OF RECOMMENDATIONS FOR STANDARDS

The following is a list of areas or jobs which should be standardized
Service-wide. (Further explanation of these recommendations
will be found later in this report).

1. Computer application evaluation and selection.

2. Computer application feasibility and systems analyses.

3. Application development and production cost recording.

4. All areas defined by the National Bureau of Standards.

5. ADP personnel performance standards including job descriptions.

6. All primary data files include descriptive locator codes to
    allow data retrieval on a geographic, political, etc., basis.

7. Evaluation of software changes and maintenance of compatible
    software on comparable hardware with comparable workloads.

8. Programming language features and programming techniques
    constrained to be compatible with the minimum hardware and
    software on which it is intended to run the application.

9. Program libraries and all documentation submitted to them.

10. Physical, magnetic tape identification and tape label
    practices. This partially dictated by the NBS standards
    presently and those forthcoming.

11. Operator, programmer, and systems analyst training.

12. Standard form numbers on computer printout sheets for production
    type applications.

13. Formats contract specifications concerning technical aspects
    of computer program development and contract administration.

14. Complete computer application documentation for production
    type or generally used routines, programs and systems and
    those routines contained in FS libraries.

15. A standard procedure for inclusion in the Forest Service
    Directives System those ADP items that are of Service-wide
    interest.

16. A standard procedure for numbering and/or indexing computer programs.

D. <u>SUMMARY OF RECOMMENDATIONS - AGAINST STANDARDS</u>

The Following is a list of areas or jobs in which standardization Service-wide would be undesirable:

1. Computer application documentation on all applications. However, all regular production or generally used routines, programs, and systems or those included in the FS libraries must conform to a set of documentation standards.

2. Organization of ADP units.

E. <u>RECOMMENDATION FOR FURTHER STUDY</u>

The following is a list of areas or jobs which warrant further study team or management attention.

1. If a set of standards or guidelines (either a complete or just a partial set) is not adopted for any or all of the following areas:

evaluating	practices	documenting
selecting	hardware	implementing
programming	software	operating

Sufficient data must be devised and made available to insure that those areas not having written procedures can be evaluated on a need for this at a later day.

2. As a part of the standards or guidelines, the area of training must receive further consideration.

3. An investigation should be made on how research in commerical industry makes use of their computer facilities - by laissezfaire or a more regimented philosophy. The survey should also

consider effects of size of computer.

4. Study team attention must be given to the degree of computer
application documentation and the required elements necessary
to fully describe the application to (1) the user; (2) the
programmer and his successor; and (3) the people responsible
for execution of the application.

F. RECOMMENDATIONS' KEY POINTS

An overriding element affecting the reason for the recommendation
is that of cost. The Forest Service has dedicated large amounts of money
to ADP. Without adequate control in the form of workable standards,
we will not be able to achieve best utilization of our equipment and
personnel with minimum costs.

Another element is that of man-years devoted to ADP. We have a rapidly
growing reservoir of experienced computer personnel which must be used
in the best manner to produce functional and long lasting products.

The item that ties these two elements together is that of management.
Without standards, a manager is ineffective and the job he has to
perform is not done adequately. To allow the FS ADP manager
to function and to function for the best benefit to the public he
serves, he must have a consistent and reasonable set of standards
to control and facilitate good work in his area.

On a national level, standards are even more important for the
effective direction and compatibility required for the effective
operation of widely spread computing facilities. It may be necessary to
have technical writers for the documentation chores.

The following describes in more detail the recommendations made by the
team. The number of the Explanation of Recommendation is correlated to
the summary of recommendations.

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G. EXPLANATION OF RECOMMENDATIONS - FOR STANDARDS

Desirable areas for standardization are:

1. The degree of standardization for evaluation and selection must be determined by further study; however, it must be standardized to some extent.

2. The need for this area of standardization is determined by:

   a. The need for additional user involvement in the initial outlining of the application. This serves two purposes,

      (1) to educate the user in the process of application definition

      (2) to educate the user in overall ADP techniques and considerations

   b. The need to insure that the application is actually designed to meet the user's needs; to prevent the user from having to conform to the application.

   c. To better determine the user's needs.

3. This should be part of the internal accounting of each unit and should as a matter of standard include:

Cost Item	Development	Production
Analysis	Yes	Maintenance
Programming	Yes	Maintenance
Computer	Yes	Yes
Keypunch	Programs & original data	Yes
Training (ADP & user)	Familiarization	Periodic Updating

This must be readily available to the unit for use in management decisions on manpower and hardware utilization and adequacy.

4. The NBS is the designated government agency for the creation and maintenance of ADP standards. It should be a policy of the Forest Service to use and support these standards insofar as they apply to our facilities.

5. With the current lack of standards to adequately evaluate the performance of our ADP personnel, we are placed in an unfortunate position of attempting to manage people without knowing really how to grade the products that are created by them. This may be termed management by exception - the exception is actually doing a first rate job and knowing it has been done.

6. Locator codes in all primary data files will in the near future yield large returns on the cost of implementing when more and more ADP work will involve data management functions (information storage and retrieval). Here standard codes are imperative for those existing land area breakdowns and for those not adequately coded, work must begin on creation of a standard identifying code.

7. This standardization has several qualifiers which are of critical importance. Of necessity, the computers must be similar to allow compatible software; however, the workload difference may effect subtle or major incompatibilities on the software of two identical computers. Even with these qualifiers, any software changes which are made to one system must not preclude the functioning of the work from a smaller or less sophisticated computer on that machine. Upward compatibility must always be maintained. In addition, changes occasionally will require

some program or processing technique modification. The changes
can be more completely tested, coordinated, and evaluated by
the use of standards.

8. In order not to stymie the development and to promote more
efficient use of computer languages, all programming must be
upwards (or even sidewards) compatible. And it should only be
technically constrained to the requirements of the smallest or
least sophisticated computer it is to be run on. Non-essential
unique-to-a-machine coding should not be allowed. Standard
features which are available on all computers should be used
as much as practical.

9. The necessity for standardization in program libraries is obvious.
Standardized libraries are essential to compile lists of and
to maintain source programs for potential users. Further, the
standardization helps assure that program inventory information
is understandable to those persons researching programs that
may be of use.

10. In order to promote interchange of data between Regions, Stations,
and especially the Washington Office, a set of criteria must be
followed for identifying magnetic tapes or other data storage
mediums.

11. To promote overall efficiency and to equip operators, programmers,
and analysts with the compatability for advancement, a uniform
set of training guidelines should be developed.

12. On all production type of applications much manpower time can

be saved with the use of standard form numbers on printed output. This greatly simplifies all references to a particular computer output report.

13. If contract specifications dealing with the technical aspects of computer program development are not standardized, then poor programming can result, target dates are missed and even the end product may not conform to Forest Service needs. Also we may not have sufficient knowledge to maintain the application programs. With the increasing amount of dollars being spent on contract programming, these specifications must be firmed up and loop holes or weaknesses eliminated.

14. Adequate computer application documentation is essential to continuted progress in the improved ADP services. It facilitates smooth transitions through employee turnovers plus hardware and software changes. If begun with the request for a new application or change to an existing one, it can effectively serve as a basis for approval of the request. Also with it those soon forgotten decisions can be recorded. In general, documentation enhances or in some case permits communication.

Without it any program development soon loses what value it had and the program and its maintenance cause many times more expense than the documentation would have caused had it been done originally.

A second facet to this standard is the degree to which and how programs should be documented. From time to time everyone has lamented on the poor quality of or difficulty in using some documentation.

It is hard to really identify what elements are needed in good documentation. When we see "good" documentation we are usually overwhelmed at the complexity of the number of elements or sometimes at the duplications contained in it.

The question is - does the 5-10% additional time and cost devoted to good documentation pay for itself over the life of the computer application? What cost savings will we realize when we convert or integrate the old application into a new one?

15. Without some standard device in which to record and store these standards, the situation, in a short time, degenerates to the condition where every individual is doing it his way if he does some item, i.e., documentation at all.

Because ADP requirements and technologies change so frequently with the immediate need to reflect these changes, it is proposed that any ADP standards be maintained as part of the Forest Service Directives System.

H. EXPLANATION OF RECOMMENDATIONS - AGAINST STANDARDS

Areas undesirable for standardization are:

1. Computer application documentation should not be made a blanket requirement in all situations. The area of one time programs or routines should be omitted from this requirement since documentation of these does nothing to enhance the benefit gained from the product.

2. ADP organization should not be categorically considered for standardization because of workload requirements, manpower ceilings plus personalities and capabilities of the employees.

QUESTION II - RECORD KEEPING

Are record keeping operations adequate to meet job needs? Would

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standardization contribute to more efficient record keeping?
Would it be desirable to develop such standardized reporting
systems for purposes of integrating with the required BOB and
GSA reports?

Recommendation

From the data available from the survey, it is impossible to
determine adequacy of current record keeping operations. The
survey concerned itself with particular records, while other
records may have been maintained that were important to
particular units. Also, a comparison of unit responses or
an analysis of a single unit is meaningless without knowing
the function, mode of operation, hardware configuration, staffing
of the unit and needs of record keeping demanded by the
organization.

A record should never be an end in itself but should serve a
useful purpose. Any record not doing this should be discontinued
and discarded. Reasons for record keeping are many and vary
among units. Those appropriate and adequate to one unit may
not be so to another unit. Each unit must determine for itself,
since each is best qualified to do so, what, to what extent, and
how information must be recorded.

Standardization of record keeping within a unit, particularly
if it is decentralized or consists of several installations,
would be of great benefit for control, status, and summary
purposes. It would be of utmost importance if a number of

people must maintain the same or similar records.

Formats for the BOB, GSA, and similar external reports are
established by the requesting agencies. Since the items for
these reports are summaries for a time period such as a FY,
quarter, etc., and there may be duplicate requests among the
reports, the workshop team recommends that a central committee
study all external report requirements to set up standards for
this particular record keeping so that these records could,
perhaps, be summarized centrally and the particular information
be sent to the requesting agencies. This would relieve the
units of periodically summarizing a lot of data.

QUESTION III - FACILITIES

What is effect of inadequate physical facilities (space) on ADP
operations?

A. Qualifications

The area of consideration was expanded by the team to include other
environmental conditions beyond space.

B. Recommendation

1. This portion of the study should be expanded to be more people
   oriented by considering such items as lighting, air conditioning,
   desk arrangement, and work area for all ADP personnel.

2. The design of future installations enlist the services of experts
   in the areas physical arrangements of ADP facilities.

3. Future installations and extensive modifications of existing
   facilities give ample consideration to expansion.

QUESTION IV - RELATIONSHIP WITH NON-ADP PERSONNEL

What effect does the larger amount of time spent on ADP work by
non-ADP personnel have on overall operations in available facilities?
Are there any special management problems associated with working
with non-ADP types or meeting their needs from a management standpoint?
Are special adjustments in such items as work scheduling required
to accommodate these users?

A. Recommendation

All personnel working with the computer should be properly
trained and their responsibilities written into their job
descriptions. This will eliminate many of the "we" - "they"
problems.

B. Background

In general, non-ADP personnel give assistance to ADP by bridging
the gap of understanding between the functional user and the
ADP specialist. Subject-matter specialists can assist in data
preparation, monitoring of inputs and outputs, and program
development. In some specific cases, non-ADP personnel are
underfoot and could perhaps help more by leaving well-enough
alone, but this is simply a local management problem.

Yes, there are special management problems with non-ADP personnel.
Training requirements and formal documentation of ADP responsi-
bilities in non-ADP job descriptions are two. The Computer
Systems Study questioned - How much time does the individual not
assigned to ADP, spend on data processing work? This was answered

by over 300 respondents. They indicated they spent an average of over 30% of their time on data processing. They also indicated that an average of 50 hours during the last three years was spent in ADP training per person. This training is, in most cases, not adequate and management fails to provide time or money for adequate training. Formal training should be planned for and ADP should assist in providing training. Exact responsibilities and formal training needs should be clearly defined for non-ADP personnel assigned to ADP applications.

Remote terminals may need to be installed to give non-ADP personnel access to files and hardware to fill their needs. It may also be necessary to change schedules on normal batch jobs to a night shift so as to provide prime time for program testing and special problems of non-ADP users.

QUESTION V - NEW COMPUTER APPLICATIONS

What conclusions can be made regarding present methods for proposing, justifying, approving and implementing new computer applications? What standardization in this area is believed to be desirable? What are the arguments favoring (or refuting) uniform procedures from a management standpoint?

A. Conclusions

1. Method of presenting proposals and justification of new applications varies from a memorandum to verbal presentations. Justification ranges from detailed feasibility studies conducted by both user group and ADP personnel, to no justification whatsoever.

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However, the majority of Regions and Stations do conduct feasibility studies on new applications.

2. Those organizations that do conduct feasibility studies involve both the subject matter specialists and ADP personnel.

3. The general trend is to delegate individual responsibility to approve and assign implementation priority.

4. Fallacies in the handling of applications which are justified but exceed in-house equipment or personnel capabilities become evident with response of setting low priority or postponement regardless of the benefits possible to get from the application.

5. On the surface, the approach of individual authority of application approval indicates minimum involvement of total organizational management. This applies especially to those managers who are heavily dependent on the availability of ADP facilities.

B. <u>Recommendations</u>

1. Collect more information designed to determine the effectiveness of the various approaches currently applied within Forest Service and other federal organizations.

2. Based on an analysis of the information collected, present to management a workable procedure complete with supporting facilities such as forms, methods, and current ADP status reporting systems. At least this is a starting point to something better than the current conglomerate of locally established procedures.

3. Responsibility for approving applications should not rest
with the ADP Branch Chief. It should be included in the
Management Analysis Section. The Washington Office is in
process of implementing a procedure whereby all National
Reporting Systems will be reviewed by management analysts.

4. Build into the above recommended procedure the facilities
to minimize if not eliminate current in-Service duplicated
efforts.

C. Background

The very absence of uniform procedures in this area indicates
that this particular topic is: (1) so new to us that management
can not get a handle on it yet; (2) it is unresolvable; or (3) it
is insignificant.

The real problems associated with working on the various current
approaches taken have been mostly between the ADP manager and
user and have evidently not become a higher level management issue.
Of necessity, this must be brought to the attention, by some means, of
higher level management.

QUESTION VI - COMPUTER APPLICATION CRITERIA

What criteria do Forest Service personnel believe are most significant
in determining whether a computer should be used or not? Based on
available information and your judgment, how do current methods of
justifying new computer uses agree with the above questionnaire
ranked criteria?

Should existing computer applications be evaluated for necessity,
effectiveness, cost/benefit, for continuation?

NOTE: The following conclusions based upon rather

hurried analysis will be more elaborately defined

and qualified in the final study report.

Conclusions

1.   Analysis of the summary tables compiled from the questionnaire

on understanding indicates that the doing level rank accuracy

as No. 1, elimination of tedium as No. 2, and capability of

doing long or complex jobs as No. 3. On the other hand the

management level ranked elimination of tedium as No. 1,

accuracy as No. 2, and doing complex or long jobs as No. 3.

2.   The ranking of the two elements namely, save manpower regard-

less of cost,and cost savings is a bit shocking in view of

the national emphasis that has been placed on the reduction

of these two elements. Out of six elements ranked, manpower

savings regardless of cost was ranked No. 6 by the average

of all levels, cost savings was ranked No. 4.

3.   In actual justification of new computer applications today,

tedium reduction plays a supporting role, and manpower and

cost savings play a major role.

4.   Existing applications should be periodically examined and

evaluated. The primary area of consideration should be the

applicationswhich are somewhat out of reach of the ADP

unit, such as user group developed and maintained systems

and/or programs.

5.   Generally, the results of this survey indicate that across

the board, the knowledge of ADP is inadequate to allow Forest

Service personnel at the present time to make judicious

decisions on the potential worth of computer applications.

It is now a situation in which ADP people can, to some
extent, force non-ADP people and processes to conform
to ADP. In other words, the tail can wag the dog.

Also, condluded from these results is the fact that Forest
Service managers must establish new drives to provide
ADP training for themselves and their people to insure
that the dog is able to wag the tail.

QUESTION VII - ADP FUNDING

What are the advantages and disadvantages of funding ADP
activities using prior year budgets with modifications based
on planned work. What are the advantages and disadvantages
of charging work directly to the benefiting unit? Is there
a better alternative or compromise?

A. Recommendation

If it is strongly felt that a change in funding ADP Operations
is needed or that a standard system for all units is necessary,
we feel that a complete study should be initiated to determine
the most useful method of funding.

B. Background

An initial assessment of funds accross the board is advantageous
to both ADP and the users. There is less work involved,
users complain only one time per year and make overall more
use of the service. In general, it is very convenient for
both. This use may not be the highest priority since users
have already paid and want to be sure to get their full value.
Disadvantages are: the user is less cost conscious of their

ADP services, applications are not re-evaluated for
usefulness as often as should be and users are not
concerned about cost/benefit.

The charging of work directly to the benefiting unit has
several good points. Each user is aware of his spending
by job and/or applications and must justify his expenditures.
ADP is more concerned with quality and efficiency. Reruns
and spoils are paid for by the users and much more planning
goes into new applications before implementation.

These disadvantages, however, deserve consideration. Detailed
record keeping is time consuming and expensive. Rates must be
inflated because of machine idle and down time and other
overhead costs. Rates have to be adjusted continually and
users tend to compare in-house rates with local commercial firms.
User complaints on reruns and spoils are many. This concept
also tends to inhibit use of the equipment.

> NOTE: General opinion of the group was that
> a change is needed and many favored direct
> charging. The feeling is that the FS would
> get more value by direct charging -- would
> cause the users to look at their applications
> more critically.

QUESTION VIII -ADP/LIAISON

Are user liaison coordinators the best way to handle this function?
Why? If not, what is? Are research coordinator or liaison needs
similar to Region needs. If not, what is the best way for them and
why?

ANSWER

A liaison coordinator, whether Region or Research situation, could
be very effective provided that his responsibilities and duties
be stated in his job description specifically and as major duties
rather than among the miscellaneous duties and that the position
be fully recognized by management. Qualification standards are
needed. This should insure having a qualified person in the
position and justification of time spent in this activity.
Particularly in a closed shop operation, he would be the source
of ADP information and advice for his division, arrange project
working relationships between his division personnel and ADP
personnel, and would do whatever is necessary to have his division
make effective use of ADP capabilities as a tool to accomplish their
assignments.

Another important function that the coordinator would serve is that
he would keep the ADP manager informed about future or potential
projects. This would help the ADP manager in his planning of staff
and equipment needs.

In an open shop, the user can be his own liaison coordinator, arranging
with the ADP manager to do his own ADP work completely, have the
ADP unit do it, or some arrangement in between these extremes.

An arrangement that has worked effectively in an open shop research
situation is to have a division technician or aid process data for
several projects in the division. While not exactly a liaison
coordinator in the same sense as previously described, he would
accept the data from the projects, see that it gets recorded properly,

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process the data, return the results to the division. One big

payoff would be in the reduction of turn-around-time. Another

benefit is that having subject matter and project background,

he can spot discrepancies and make corrections and adjustments

as the data moves through the ADP operations.

Each organization should determine which methods or combination

of methods work best for them to help accomplish the mission of the

total organization.

QUESTION IX - OPERATIONS MANAGEMENT PROBLEMS

Do the more frequently reported problems in Table 22 - 24
and Information Source B suggest operations management actions
that would contribute to improved ADP operations? List possible
actions in sequence along with any arguments or justifications
you feel would lend credence to such a course.

ANSWER

1. Table 22 is a summary of answers from DP managers
    regarding primary user complaints in programming
    and systems analysis support. Time delays ranked
    number 1; inadequate number of analysts/programmers
    ranked number 2; and inadequate equipment and/or
    available computer time ranked third.

    This is an area where the addition of remote terminals
    or a time-sharing service would relieve user complaint.

    Many of the one time and/or small programs can be
    handled by the user with proper training and relieve
    the workload and time lags as well as add available
    computer time and capacity.

2. Table 24 is a ranking list of common complaints from
    users regarding data processing operations services.

    The number one complaint was keypunch errors and number
    two was slow data preparation during peak work periods.

These indicators point toward decentralized data preparation.
Functional specialists can prepare their own data with
greater concern and the result will be greater accuracy.
It is questionable whether a keypunch would be used
but other equipment is becoming available and in some cases
current equipment can be used (IBM-MT/ST). This approach
would take some training but would not necessarily increase
personnel.

Added problems include: input coding which indicates a
need for more effective systems analysis,and output
readability which may mean further use of printed forms,
computer translation and perhaps the use of reduction equip-
ment to enhance workability.

TABLE 22

Most Common Complaints Received from Computer Users Regarding Systems Analysis and Programming Services.

Complaints	Regions		Stations	
	Number Responses	Rank	Number Responses	Rank
Time delays	5	1	5	1
Inadequate training resource terminology	1	6		
Inadequate contact with programmers	1	7		
Inadequate number of analysts/programmers	3	2	5	2
Evaluation of applications too complicated	1	6		
Inadequate programs and resultant output	3	4		
High cost	1	7	1	5
Setting of priorities	1	6		
Inadequate equipment and/or available computer time	3	3		
Inadequate backup when processing problem encountered	1	6		
Communications problem between user and analyst	3	5		

TABLE 22 (cont.)

Complaints	Regions		Stations	
	Number Responses	Rank	Number Responses	Rank
Lack of direct access to computer	1	7		
Need ADP training for users			1	3
Underestimates of job size, time, and cost			1	4

TABLE 23

List of Most Common User Complaints Related to Systems Analysis and Programming as Reported by ADP Managers.

	Total Units Reporting Complaints	Units Reporting Complaint	
		Regions	Stations
Time (delays in Prog.)	9	11,31,41,91,Eng.	NE, PNW, SO, FPL
Terminology	2	12, Eng.	
More contact with Prog.	1	13	
Not enough people for W/L	8	21,61,81,Eng.	INT, NC, NE, PNW
Need to much detail	1	22	
Not what I wanted	6	32,43,53,83,92, 10	
High cost	4	33	INT, PNW, SO
Low priority	1	42	
None	2	51, 52	
Turn-around time	2	62	FPL
Computer - backup	1	82	
Programmer Attitude	1	93	
Lack of direct access to computer	1	10	
Access to expert consultants	1		PSW
Users want training in ADP	1		RM
Service people refused to do job	1		SO

TABLE 24

Most Common Complaints Received From Users by DP Managers Regarding Data
Processing Operations Services.

Ranking of Common Complaints		
1	2	3
Keypunch errors (01)	Slow data prep. during peak work periods (01)	Programs not flexible enough for regional requirements (02)
Limited equipment capability (02, PSW)	Limited personnel (02)	Limited equipment capability (03)
Cost of outside services (03)	Scheduling conflicts and slow turn-around (03,04,06,08,FPL,PSW)	Data lost, no reports received (04)
Output errors (04,08)	Machine down time (05)	Slow turn-around (06)
Scheduling conflicts and poor priority setting (05,06,09,FPL,INT)	Underestimating program needs (INT)	Job set up (08)
N/A (10,ENG,NC,ME, PNW,RM,SO)		Machine down time (FPL)
No complaints (SE)		Lack of operator expertise (PSW)

SECTION 7

ESTIMATION OF ADP MANPOWER REQUIREMENTS

Members   Team 2

Name	Title	Organization
Floyd J. Burnett *	ADP Branch Chief	Region 4
Dorothy E. Martin **	Statistician	PNW Station
Alan D. Freas, Jr.	Computer Systems Analyst	WO Div. of Adm. Mgt.
Donald W. Seegrist	Biometrician	NE Station
Deward W. Singleton	Computer Systems Analyst	Region 8

* Team Leader   ** Recorder

TEAM OBJECTIVES

Review and analyze available information pertaining to the
estimation of manpower requirements by key tasks or job groups
and develop a system for determining manpower requirements based
upon defined workload. Prepare a list of key tasks or job groups
that segment ADP activities into definable work units permitting
estimation of manpower requirements. Prepare tables of conversion
time factors and/or equations for this purpose

Introduction

In our attempt to devise ways in which to estimate manpower requirements based on workload, we quickly discovered that there is only one firm conclusion which can be reached--there are no pat-answers, no formulas. All determinations must, in the end, be based on judgment and experience. Guidelines can be furnished, and rough formulas used in some cases, but all they really provide is a place to start. This is what we have attempted to provide in this report. Any attempt to use this report as gospel is fallacious!

Our approach has been to identify the major areas of responsibility and to define and list the particular tasks which we feel fall into each area. While it may appear that we are describing actual positions, and perhaps a specific organization, we only intended it to show that these are the tasks which will have to be done regardless of who does them. In the larger organizations, individual areas can be assigned to individual positions. In the smaller organizations, two or more of these areas will be assigned to the same position, and in still others, all of these duties could be assigned to only one or two positions. Research organizations are an example of the latter.

No consideration has been given to cyclical impact, or random arrival of work. These guidelines assume a fictitious, even distribution of work throughout the year. It is a management decision whether to staff for an average volume of work, for peaks, or whatever.

Following is the list of major manpower specialties that was
developed as a guide:

    I Keypunching

   II Computer Aid or Control

  III Scheduling

   IV Operations

    V Programing

   VI Systems Analysis

  VII Management/Supervision

Each of these is treated in detail in the following analysis.

I. KEYPUNCHING

The study team developed the following relationship to estimate the
number of keypunch operators needed for an ADP operation:

$$\text{Number of operators for punching only} = \frac{\left[\dfrac{\text{of Columns/Hour}}{7,000 \text{ Columns/Hour}}\right]}{1,560 \text{ Hrs./Yr.}}$$

(To include key verification, increase result in proportion
to the percentage of key verification required)

Where:

a. Number of operators is expressed in number of man-years
exclusive of supervisory responsibilities;

b. Number of data columns punched per hour is an estimate
based on the yearly workload;

c. Seven thousand (7,000) is the average number of key strokes

per hour based on production standards of 8,000 key strokes per

hour for simple work and 5,000 key strokes per hour for difficult

work;

and

d. One thousand five hundred sixty (1,560) is the number of

hours in three-fourths of a man-year. (We consider that only

75% of a keypunch operator's time can be productively utilized.)

II. COMPUTER AID OR CONTROL

The study team divided the control functions of a medium sized*

computer installation into two major categories --

 Control

 Library

1. CONTROL

Tasks

 A. Quality assurance and control

 B. Job set-up

 C. Work distribution

 D. Decollating

 E. Scheduling

 F. Data input preparation

 G. Data output breakdown.

 * CDC 3100 used as an example of medium-sized computer
  installation.

Criteria

The following formula is recommended as a guideline in
determining workload requirements:

$$\text{Man-years} = \frac{(\text{No. of Jobs Processed}) \; (\text{Average Time/Job})}{1,560 \; \text{Hrs./Yr.}}$$

Where, Volume of work = number of jobs/year (each

individual submission is regarded as a "job"

whether it is for punch only, PCAM, computer run,

or other)

Average hours/job = time needed to do control work.

(NOTE: R-4 estimates avg. time per job in their

situation at 20 minutes)

1,560 hours = average productive man-hours in one

man-year.

2. LIBRARY

Tasks

    A. Tape storage

    B. Cards (data)

    C. Programs (both documentation, source and object decks)

    D. Disk storage.

Criteria

The criteria for determining the workload requirements in this
function consist of:

    1. Size of library

    2. Use or number of accesses to library

    3. Time spent on each type of access

    4. Degree of control required.

III. SCHEDULING

Tasks

    Within specific guidelines, schedules routine work units through --

        1. Keypunch section

        2. PCAM operations

        3. Computer section

Criteria

        1. Multiple computer systems

        2. Number of work units

        3. Multiple priority systems

IV. OPERATIONS (Computer, PCAM or Terminal)

The study team felt that the number of operators needed in any ADP operation are dependent primarily on two factors:

(1) The types of equipment and number of peripheral equipments that require manual intervention.

(2) The over-all workload which includes the number, length and complexity (operator intervention) of jobs being processed and the number of shifts in the operation.

In general, for each system (Computer, PCAM group not incidental to computer or terminal), these factors would mean a minimum of one operator per shift and a maximum of two operators per shift except when a large number of peripherals might require three or more operators. Beyond this, consideration must also be given to insuring that there are a sufficient number of

operating personnel in the total organization to cover for
unexpected absences, extensive reruns, and other emergency
situations.

The above apply equally well to each of the three fields.

V. PROGRAMING

Programing in an ADP shop includes three major activities:

(1) Development of new programs;

(2) Maintenance and modification of existing programs;
and

(3) Modification and development of software.

Developing new programs includes program design and analysis,
coding and flow-charting, debugging and testing, documentation,
implementation and training. Part of a programmer's time is
also taken up with implementation of the system and training
the users.

About 65 percent of a programmer's time is productively spent
on the above tasks for approved projects. Programing
production depends on the programing language and the com-
plexity of the problem. Complex problems require a high level
of competence and, often, more time. The number of programers
is also a function of the number of programs needed. One must
consider the elapsed or leadtime allowed.

In a new ADP organization there will be little or no maintenance
programing but within 2 years, 40 to 60 percent of the total

programing workload will be maintenance or modification of existing programs. Some studies have shown a 30-35 percent rate, but we don't know the basis for this and suspect it was a situation where criteria listed below were closer to ideal than what we feel is a typical situation.

Production of maintenance programers depends on the quality and complexity of programs, and on the quality of program documentation. The total workload is a function of the number of programs, number of problems or changes needed, and the complexity of the program and changes.

The third programing area in an ADP shop involves the modification and/or development of computer software. Software includes operating systems, system sorts, compilers, and generalized I/O routines. There can be in-shop development of generalized routines and communication routines. It is a management decision as to how much time is devoted to software development. The manpower needs also depend on the size of the computer involved.

Our considered opinion is that regardless of the management decision, the absolute minimum workload required for maintaining the software furnished by the manufacturer will be:

Size of Computer	Man-Years (Minimum)
Small	1/4
Medium	1/2
Large	2
Extra large	???

These figures are admittedly highly speculative, and are definitely not intended as a guide to determining how many people are needed to handle software. Rather they are intended to insure recognition of the fact that experience indicates that even with no intention to do in-house maintenance of manufacturers software, there will be a workload impact on the organization.

As an estimating guide, we can only offer our opinion that any organization with a medium sized computer should have at least one programmer assigned full time to software, and with a large computer at least three. We won't even hazard a guess for larger computers. Since this is extremely complex and critical work, we feel it is vital that the personnel assigned be highly competent, and at the GS-12 and above level.

VI. SYSTEMS ANALYSIS

The study team divided the systems analysis functions into the following categories.

Tasks

   A. Feasibility studies

   B. Problem definition--as related to computer solution

C. System design --

    1. Program languages

    2. Number of programs

    3. Program types

        (Report-generator, sort-merge, utility)

    4. Input/output requirements

        (Disk, magnetic tape, paper tape, card, etc.)

D. Testing and debugging

E. Implementation and training.

This would include training of computer personnel in

processing data, as well as user in data preparation and

utilization of output data.

F. Review and analysis of system objectives for existing

applications. This task would involve review of objectives

set forth in problem definition, determining that original

objectives were met, and determining if reporting require-

ments have changed since implementation of system.

Criteria

Because of the nature of this function, only about 50 percent of

this function can be classified as time productively spent on the

above tasks on approved projects. To be effective, the remainder

is spent on

    1. Consultation

    2. Listening

    3. Training

    4. Review

Based on a mixture of types of work (complex and routine),

the study team recommends --

    A.   One analyst for each two development programers and

    one for each five maintenance programers, or

    B.   One analyst for each three programers where develop-

    ment and maintenance duties are combined.

VII. MANAGEMENT/SUPERVISION

The following are items which we feel are a management function as
opposed to productive work:

    1.   Planning, organizing and administering the ADP program

    for the Region, Station, Area, etc.

    2.   General management of the ADP organization.

    3.   Development and coordination of plans for equipment

    and personnel.

    4.   Review and evaluation of ADP services provided.

    5.   Participation in meetings.

    6.   Participation in special studies, both Service-wide

    and local (ADP/MIS, GSA Sharing, F.S. Computer Systems

    Study, etc.).

    7.   Preparation, review, and follow-up on ADP budget.

    8.   Determine needs and implement training.

    9.   Personnel management.

    10. Participate in audits and inspections.

Based on data compiled in connection with the Interim
Revision of Regional Office Base Workload (12/67), approx-
imately 17 percent of the total ADP time has been devoted
to the above areas in the Regional ADP Organization. While
this cannot be taken as an accurate guide to needs, use of
this figure should give a good starting point in determining
manpower requirements for management functions. It should
also be recognized that these responsibilities are spread
among several positions, and represent only part of the duties
of most of them, and full-time duties for only one. Note, how-
ever, that a large organization may require two or more positions
with full-time management duties.

A. GENERAL OFFICE

No attempt has been made to determine staffing needs in this
area. It should be recognized, however, that an ADP staff
generates clerical work and consideration must be given to pro-
viding for the following either inside or outside the ADP organ-
ization:

1. Typing (program and systems documentation, memos,
   vouchers, etc.)

2. Filing

3. Handling of phone calls

4. Travel arrangements

5. Financial

6. Mail

7. Reproduction.

TEAM COMMENTS

Manpower savings can be achieved by centralization and standardization of any one or combination of:

Systems Analysis

Programing

Computer Operations

Software Development and/or Implementation

Documentation Standards

These same jobs would otherwise be done by many other units or organizations.

Use of the word centralization means utilization of administrative controls to (eliminate, control or reduce) duplication of effort. Centralization does not necessarily mean one central computer system.